INDUSTRIAL REFRIGERATION

New Application of Heat Pump ..... Page 13

Brewery Increases Refrigeration Efficiency by Modern Engineering Techniques ..... Page 17

New Trade Rules for Refrigeration and Air Conditioning Contractors ..... Page 21

Improving Refrigeration Systems ..... Page 29

VOLUME 130

NUMBER 6

JUNE, 1956

Now- Trade In! Trade Up!

Up to 24 months to pay on Gifford-Wood's famous Type CA cuber

GET THIS NEW 26,000-AN-HOUR CUBER WITH G-W'S GREAT NEW TRADE-IN DEAL!

Here's a top deal that can increase your ice cube volume overnight! Think of the extra business you'll handle... the reduced labor and handling costs you'll have... and the years of trouble-free service you'll get with a new Gifford-Wood Cuber in your plant.

And the best news is G-W's generous trade-in offer! Turn in your old G-W Cuber—it serves as your down payment. Then take up to 24 months to pay with G-W's new and easy Pay-Way Plan! You're earning big profits while your G-W pays for itself by turning out up to 26,000 perfect ice cubes an hour.

G-W's Type CA Cuber is specially designed to eliminate ice waste. As soon as the first cake is ¾ cut, the second cake slides easily into place, pushing the remaining quarter into the saws. And every part of the cuber that touches the ice is not only sturdy, but completely corrosion-proof. Maintenance costs are rock bottom.

Write today for a Bulletin which fully describes this advanced Type CA... and let a G-W representative tell you just how much you'll get when you trade in your old G-W Cuber. (You'll be pleasantly surprised!) And if you're just coming into the market for a large-volume cuber, why not find out how a low-cost, *completely reconditioned* G-W Cuber can build up business—*fast!* For even if you don't have a cuber to trade, you may wish to take advantage of G-W's terms!

1621

GIFFORD-WOOD CO.
Hudson, N. Y.

New York 17
420 Lexington Avenue

St. Louis 1
Railway Exchange Bldg.

Chicago 6
565 W. Washington St.

Pacific Coast Representative:
Western Ice Equip. Co., 420 Market St., San Francisco 11

Scorers, Breaker-Elevators, Conveyors, Breakers, Tools and all types of ice handling equipment.

GIFFORD-WOOD CO., Hudson, N. Y.

☐ Send me your Bulletin on G-W Cubers.

☐ Ask a G-W Representative to call with full information on your proposal at no obligation to me, of course.

Name_____

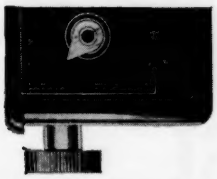
Address_____

City_____ Zone____ State_____

ELECTRIC Heating Cable DEFROSTERS

for LOW TEMPERATURE DOORS

1 • Temperature adjustment control.



2 • Adjustable thermostat for range of +85° to +245° F.

3 • Steel electrical outlet box for making connection between heating element and thermostat—inlet for power.

4 • Rabbeted channels into casing.

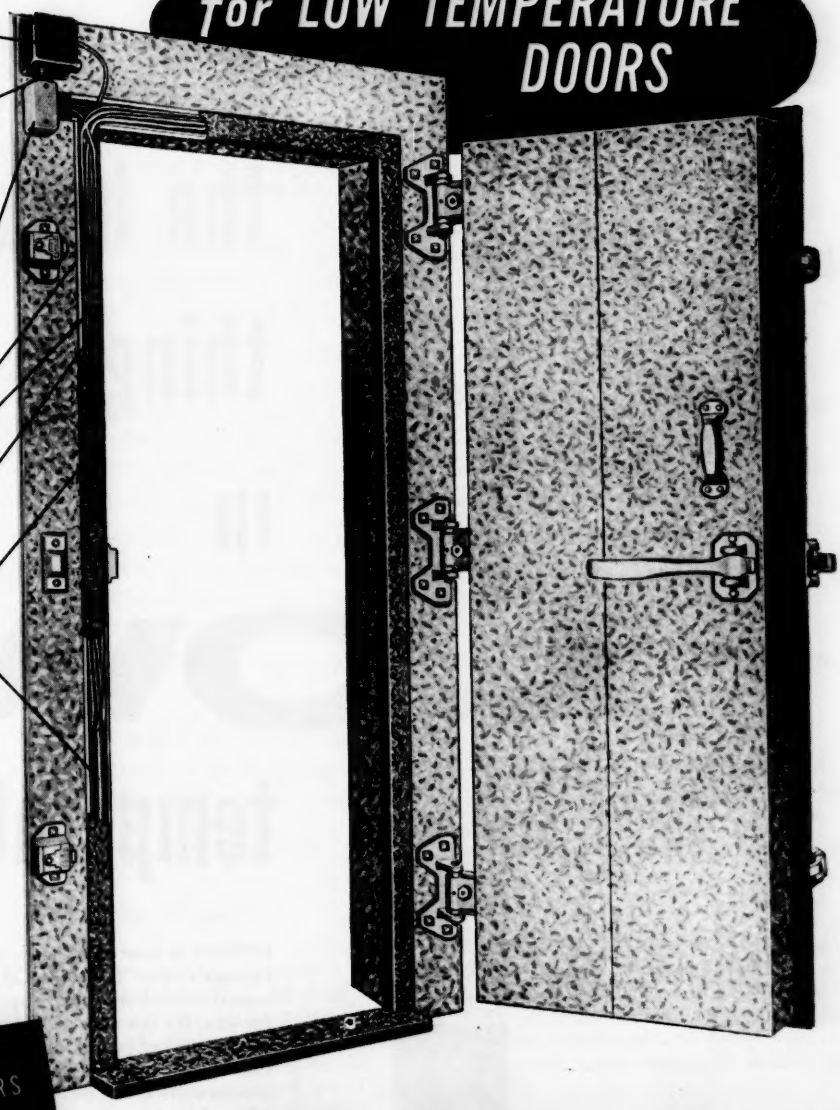
5 • Fireproof No. 26 gauge galvanized metal lined inside channel.

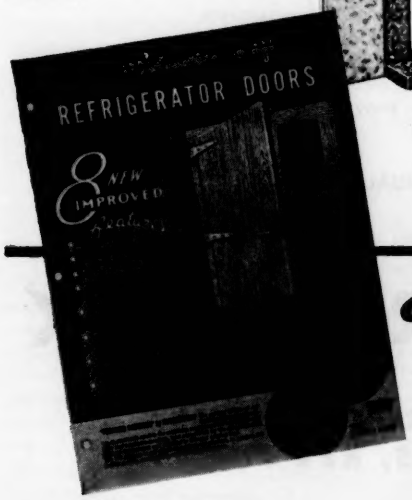
6 • Lead covered "heater cables" (4) held down securely by clips —approximately 20 watts to a foot. (110 volts—60 cycles).

7 • No. 10 gauge galvanized steel cover plates—removable.

8 • Capillary tube controls (on and off) thermostat.

The purpose of heating cables is to prevent icing conditions at the frame and sill areas where the door gaskets make their contact. The cables which are recessed into the frame casing are electrically heated and controlled by a "calibrated thermostat" (new improved feature by Butcher Boy), adjustable above the "dew point" of the air temperature. Since the heat expended prevents condensation it thus prevents freezing conditions.





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KRAMER **THERMOBANK**

KRAMER TRENTON COMPANY
Trenton 5, New Jersey

STAND-OUT

Research on Frozen Concentrated Milk

A REPORT by the National Research Council of Canada states that the high nutritive value of milk and milk products has constantly stimulated a search for stable forms of long storage life. Butter, ghee, and innumerable forms of cheese were undoubtedly developed as a means of preserving a portion of milk's food value or of utilizing soured milk. Only recently has it been possible to preserve milk in its original form: as a drink.

Sterile canned concentrated milk, sterile canned whole milk, whole milk powder, and skim milk powder can be reconverted to milk for drinking, even after long periods of storage. But none of these products equals fresh milk as far as flavor and overall acceptability are concerned.

This is where frozen concentrated milk comes in. This relatively new product is prepared by concentrating milk to one-third the original volume; this step reduces subsequent processing and handling costs. The product is preserved by freezing; unlike heat sterilization, this method does not lead to undesirable flavor changes, when freshly prepared, the product may be rediluted to a beverage indistinguishable from fresh bottled milk.

Unfortunately, this high quality is lost rather quickly unless the product is stored at very low temperatures (−20 to −40 F). Although precautions must be taken to avoid development of oxidized flavours, the major problem in the storage of frozen milk is that it undergoes changes that lead to separation of casein as a curd when the product is thawed. Recent studies in the food chemistry laboratories of NRC's Division of Applied Biology have been designed to determine the basic causes of this change.

Experimentally it has been possible to show that freezing milk at 10 F increases the salt concentration of the unfrozen liquid to about 0.6M and the lactose concentration to about 3M and that there is an increase in acidity to pH 5.8. Observations in these laboratories and elsewhere have shown that in frozen milk stored at 10 and 15 F, crystallization of the lactose coincides with coagulation of casein. Lactose crystallization may actually "trigger"

(Continued on page 56)

Industrial Refrigeration

formerly ICE AND REFRIGERATION
Now in its 65th Year of Publication
J. F. NICKERSON, FOUNDER

Vol. 130 **June, 1956** **Number 6**

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The Cover:

These fully automatic controls handle all climatic situations for new compound compression heat pump system described in article starting on page 13. As the weather goes from hot to cold or vice versa, these controls keep the inside temperature at the desired level. In the foreground is the Minneapolis-Honeywell temperature control panel, while the General Electric motor-control center is contained in the adjacent panel.

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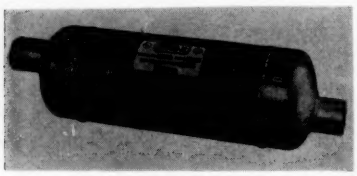
What's New

MACHINERY
APPLIANCES • PROCESSES

Refrigeration Muffler

HEAT-X, INC., Brewster, N.Y. has introduced a line of mufflers for use in reducing pumping noise in refrigeration or air conditioning systems. Easily installed on the discharge line of any refrigeration compressor, the muffler eliminates pulsations and vibrations in the lines.



New Heat-X Muffler

Low cost, simple in design and construction, the mufflers assure complete smoothness of system operation, thereby reducing maintenance cost and prolonging equipment life.

The Heat-X mufflers are built to A.S.M.E. specifications and feature seamless pipe and rugged, all welded steel construction. Expansion chambers and baffles are arranged for maximum efficiency and minimum pressure drop. No maintenance is required.

Uni-Crest New Material For Low Temp Insulation

A LOW "K" factor coupled with lightness in weight, ease of installation, and inexpensive cost makes United Cork Companies' new Uni-Crest the ideal material for low temperature insulation. The U. S. license to manufacture and market Uni-Crest, an expanded and expandable polystyrene, has been acquired by United Cork Companies. Original patents for the manufacture of this unique material are the property of Badische Anilin & Soda-Fabrik A. G. of Ludwigshafen, in West Germany.

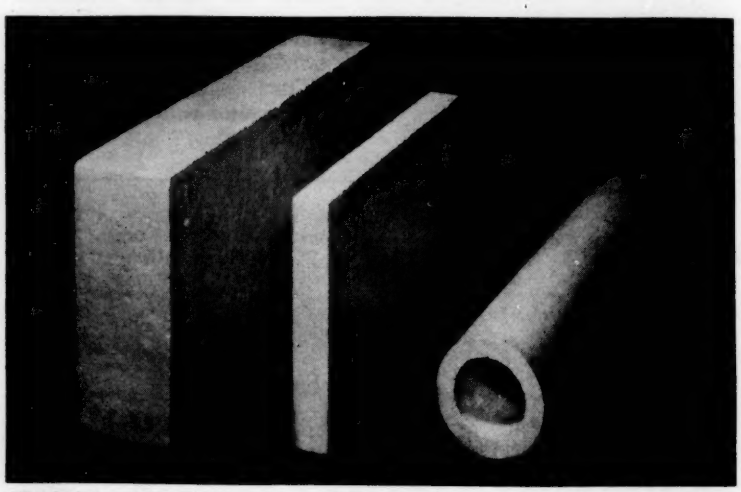
Flexibility of thin sections of Uni-Crest makes possible easy installation around curved surfaces.

The license permits the company to utilize the processes and techniques developed by European chemists during the post war years. These processes and techniques permit the molding of the polystyrene "beads" into any shape or form desired with a controllable density. The flexibility of Uni-Crest in thin sections makes possible easy installation around curved surfaces, even in difficult tank and refrigerator car construction.

Uni-Crest will be available late this Spring in molded slab, brick, or block form in lengths up to 12 feet, widths up to four feet and thicknesses up to eight inches. Additionally, it will be molded to specification in any number of shapes, sizes and densities.

The finished product is made from "beads" resembling very coarse grains of sugar. When expanded and welded together they form a homogeneous snow-white product composed of minute individually closed cellules. It is extremely lightweight ranging from 1 to 20 lbs. per cu. ft. The finished product can be produced at any specified density within the range cited. The rate of heat transfer is extraordinarily low and the moisture absorption is lesss than ½ of one percent, even after days of total submergence. Its coefficient of expansion is small, approximately that of tin.

As an insulation material, Uni-Crest is excellent for cold storage plants, breweries, dairies, freezing rooms, cold lines, refrigerators and home freezers, ice cream plants, air conditioners, milk coolers, milk tank trucks, refrigerated trucks and railway cars.



Molded in slab, brick, or sheet, Uni-Crest has a large variety of uses. Insulation for cold temperature rooms, refrigerators, air conditioners, and pipe covering are a few.

New Insulation Installation Method

"DIRECT ADHESION" of Styrofoam insulation to masonry ceilings with "Fire-Ban" eliminates stripping, shoring, nailing, skewering and open time, according to the manufacturer. Fire-Ban sets to a permanent bond that defies separation, even by force, it is said. Direct adhesion of Styrofoam with Fire-Ban is equally efficient on other porous surfaces such as wood and on non-porous surfaces. For detailed information, write for illustrated Bulletin 34, to E. H. O'Neill Floors Co., 2525 South 50th Ave., Cicero 50, Ill.

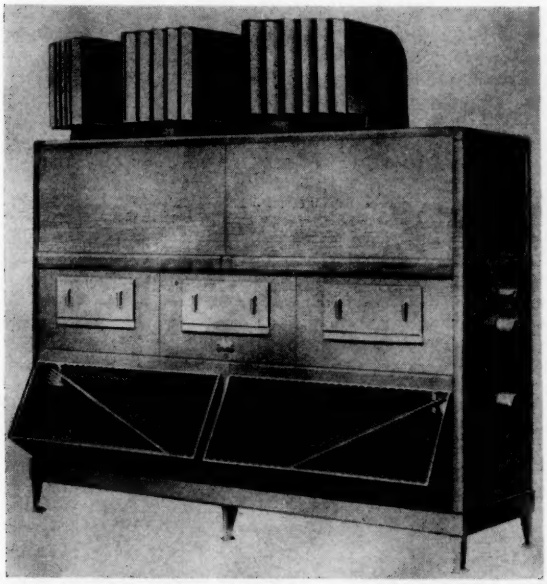
Applying Styrofoam To Masonry Ceiling

New Gas Mask

A NEW versatile air mask that weighs only 35 pounds and provides one-third more working time has been developed by Fyr-Fyter Company of Dayton, Ohio. The Fyr-Fyter Air Mask protects against an endless variety of gases. Included are carbon monoxide, hydrogen sulfide, aromatic hydro-carbons, carbon dioxide, chlorine, ammonia, hydrofluoric acid, phosgene and aldhydes gases and gasoline, benzine and naphtha vapors. They are equipped with two cylinders, each holding 26 cubic feet of air, easily mounted on the wearer's back.

Recold Offers Versatile New Refrigeration Floor Units

A VERSATILE new Recold refrigeration floor unit is offered by Refrigeration Engineering, Inc. for refrigerated warehouses and other large space applications. Units are available for high temperature or low temperature use, with or without defrost. Low temperature units can be ordered for Freon, direct expansion ammonia or flooded ammonia with water defrost, with coiled pan for hot gas, or without defrost. Low temperature capacities include seven sizes from 19,500 to 151,000 Btu's per hour at 10 F temperature differential.



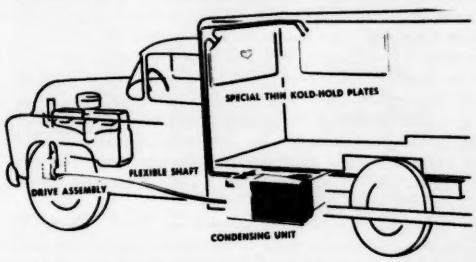
New Recold refrigeration floor unit offered by Refrigeration Engineering Inc.

Water defrost floor units use the same simple defrosting method as the Recold water defrost ceiling coils. Tap water running over the coils removes frost so quickly that product freezing continues without interruption.

The new floor units have heavy duty angle iron frames, heavy gauge galvanized panels, extra heavy hot-dipped galvanized sump pans, rugged galvanized wheels and hot-dipped galvanized scrolls, self-aligning sealed ball bearings, standard motors of recognized manufacture, cast iron pulleys and precision ground shaft with rust preventative coating. Discharge grilles have 12 different arrangements with hundreds of combinations to direct air wherever needed.

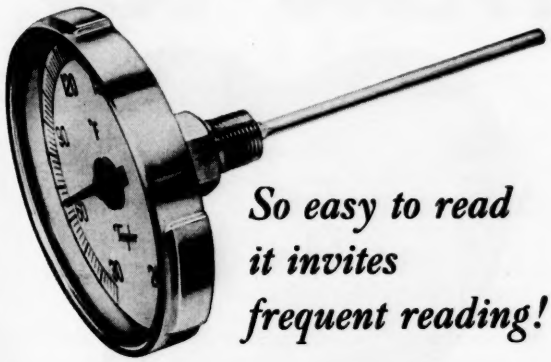
Continuous Truck Refrigeration

A NEW system of continuous truck refrigeration, weighing only 350 pounds and providing fast pulldown, ease of installation, simplicity of operation and maintenance, and precise temperature control as low as −14 F, is announced by the Kold-Hold Division of Tranter Manufacturing, Inc., Lansing 4, Mich. Revolutionary design of the condenser and elimination of auxiliary en-



Mark system of continuous truck refrigeration

NEW TAYLOR BI-THERM* DIAL THERMOMETER



So easy to read it invites frequent reading!

A simple, dependable, and economical thermometer with many practical applications in industrial refrigeration. Wide variety of ranges from minus 40° to plus 750°F. Available with three or five inch dials, and stem lengths of 4, 6, 9, and 12 inches.

EASY TO READ: The large dials are highly readable because of black figures and graduations on an aluminum background.

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ECONOMICAL: Costs only **$16** to **$26,** depending on dial size and length of stem. Ask your Taylor Field Engineer, or write for **Bulletin 98267.** Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

*Trade Mark

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DEFROST PROBLEMS?
Here's the ANSWER!...

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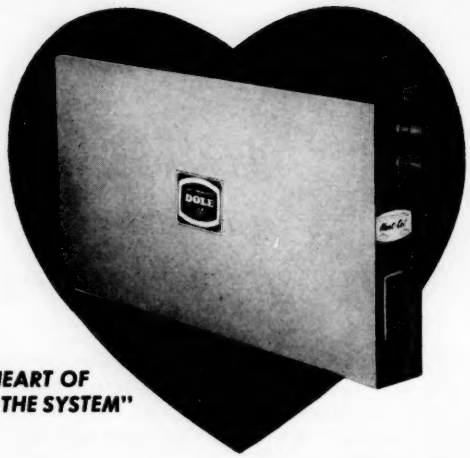
Heat-Cel



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103 PARK AVENUE, NEW YORK 17, N. Y.
In Canada: Dole Refrigerating Products Limited
44 Elgin Street, Brantford, Ontario

gines or batteries for power have cut the weight factor to the barest minimum. The high capacity of the condenser has been achieved by making use of the entire surface of the cooling coil.

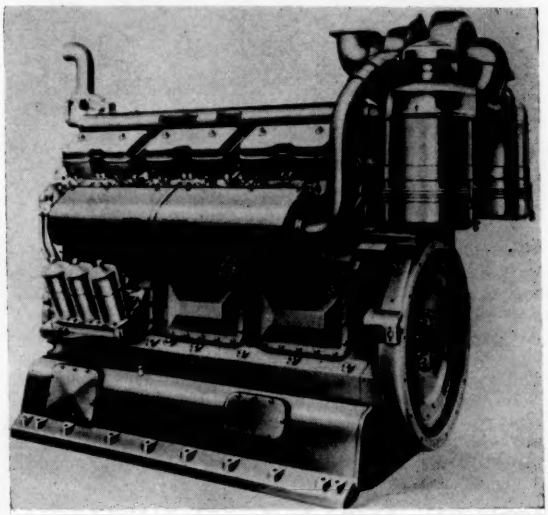
The Mark system is driven by a simple, mechanical power train to save the weight of troublesome auxiliary equipment. Power is derived from the engine crankshaft pulley through a simple electric clutch, then transmitted to the condenser through a flexible shaft. Total weight of the entire drive assembly is 64 pounds. Stand-by power is provided by an electric motor that drives the condenser without operating the truck engine.

The unique fan and shrouding design of the Mark system Ram-Jet condenser utilizes the entire coil surface for dissipation of heat as the fan is mounted with blades at right angles to the coil at its forward end. Total weight of the condensing unit is 286 pounds. The entire assembly is skirt-mounted directly on the vehicle chassis. The condenser fan is driven by a high-speed generator that requires no battery.

The Kold-Hold plates feature simplified construction and installation. They are available in a wide range of sizes and with various eutectic solutions to meet all requirements.

Caterpillar Introduces Two New Engines

TWO new heavy-duty V-type engines have been announced by Caterpillar Tractor Co. Capable of producing up to 650 hp (maximum), the new units add increased versatility to the company's line of modern industrial engines. Available in turbocharged, roots-blown, naturally aspirated and spark ignited versions, the new eight and twelve cylinder D375 (Series D) and D397 (Series D) engines are of four-cycle design, as were their predecessors, the D364, D375, D386 and D397.

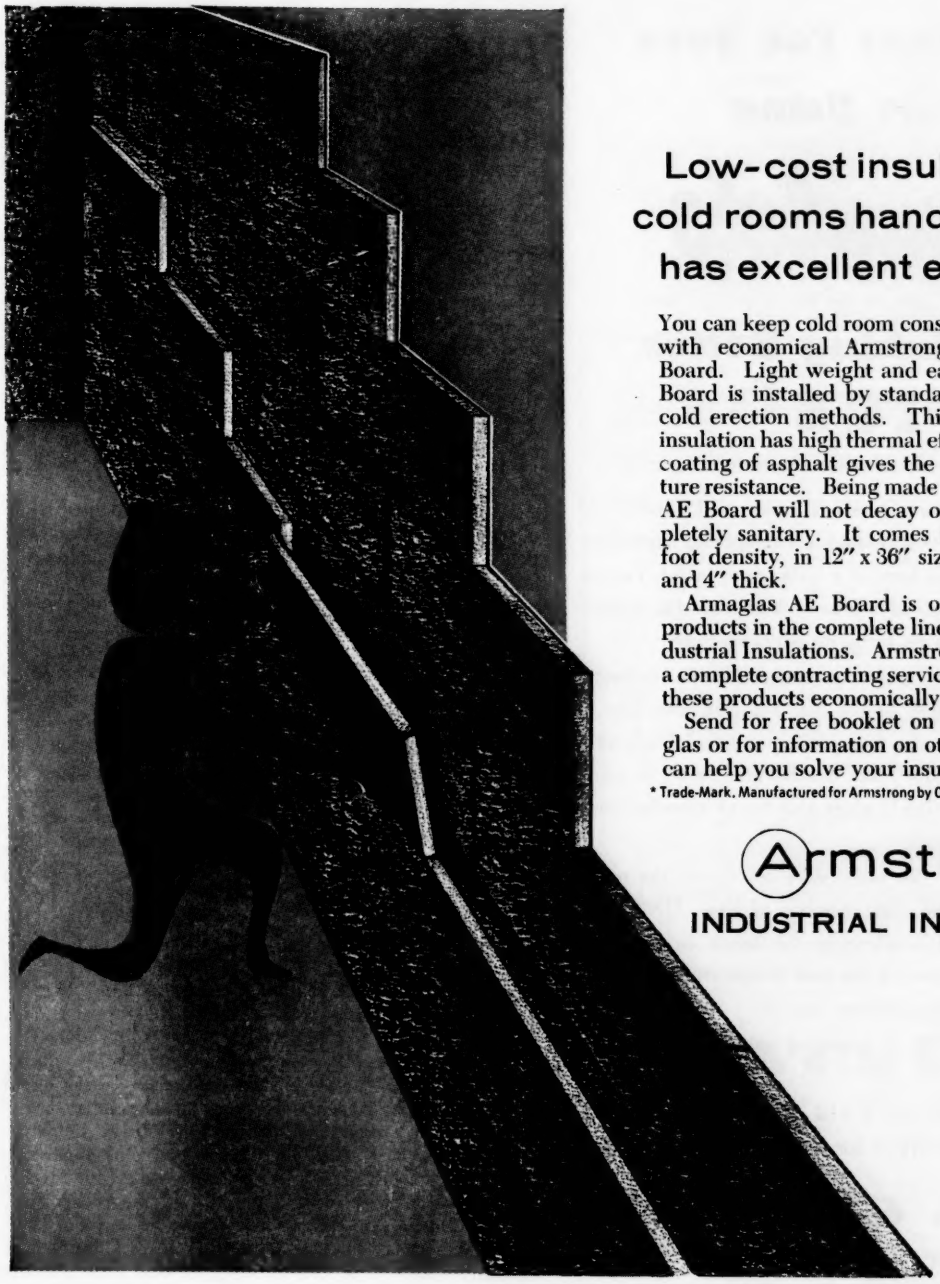


Left rear view of new 650 hp Turbocharged Cat D397 Diesel engine

Principal differences between the new engines and the former models are in the cylinder heads, exhaust manifolds, method of supercharging, and in the case of the spark-ignited engines, the fuel used and the method of igniting it. Inherent advantages of the former models, such as the completely water-jacketed, port-free cylinder liners and the low injection pressure, precombustion chamber type fuel injection system have been retained.

The new turbochargers now available for these engines enable them to produce increased power with less fuel by using the energy of exhaust gases which would otherwise be wasted. Improved engine breathing ability, the result of a new cylinder head design, makes it possible for the new units to take full advantage of the extra air made available by supercharging. The new cylinder heads provide a more direct path from the combustion chamber to the exhaust manifold.

New exhaust manifolds are offered in "dry," "shielded" and "wet" versions to enable users to adapt the engines to their specific needs. The new shielded manifolds utilize heavy layers of fiber glass, encased in steel, to keep heat out of the engine room.



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Armaglas AE Board is one of the quality products in the complete line of Armstrong Industrial Insulations. Armstrong also offers you a complete contracting service, geared to install these products economically and efficiently.

Send for free booklet on Armstrong Armaglas or for information on other materials that can help you solve your insulation problems.

* Trade-Mark. Manufactured for Armstrong by Owens-Corning Fiberglas Corp.

Armstrong

INDUSTRIAL INSULATIONS

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☐ How to Select Low-Temperature Insulation

☐ Armstrong Insulcolor®, Weatherproof Coating in Seven Colors

☐ Armstrong LT Cork Covering, a New Type Cold Line Insulation

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PRESS BRIEFS

Refrigeration Service To Produce Dealers To Be Continued

A POSSIBLE bolt to New Jersey by New York's butter and egg wholesalers was avoided when the industry was assured of continued piped-in refrigeration service. Last month, the Merchants Refrigerating Company threatened to cut off delivery of chilling brine into stores of about 200 dealers unless it got major concessions from the Bureau of Franchise.

The company distributes the brine through an underground pipe network leading from its plant on North Moore St. Under franchise terms, it must maintain repairs, alterations, and maintenance, no matter how costly. The company said that unless it was freed of this responsibility, it would end the service.

Recently, according to Sylvester B. Sheridan, director of the Franchise Bureau, the city informed Merchants that it is willing to ease the terms. The company will not be liable for major repairs or alterations. Wherever a break occurs, firms on the broken end will be shut off from the brine.

However, the city stipulated that it would not grant the eased terms unless 80 percent of Merchants' customers agreed to the decreased franchise requirements. So far, about 100 had accepted the plan. Many of the wholesalers have threatened to move if service had been shut off entirely.

Atoms Frozen By Experts

GOVERNMENT scientists have announced that they successfully conducted experiments with "frozen atoms" which might lead to development of a "superpowerful" rocket fuel. The national bureau of standards disclosed that it had "frozen solid," at 450 degrees below zero, pieces of molecules which exist only briefly in flames and hot gases. It told of beautiful blue "flashes" and "flames" observed at the coldest temperature known.

The bureau said it believed that it had produced in solid form atomic nitrogen, oxygen and possibly atomic hydrogen, as well as an unstable molecule consisting of one atom of hydrogen and oxygen. The experiments may have "ramifications" in such practical fields as production of a rocket fuel more powerful than any now known and in improved sterilization of food. Atomic hydrogen or nitrogen might be used in the rocket fuel.

Reporting on the experiments to the Washington Philosophical society, Dr. H. P. Broida of the bureau of standards said, "It is characteristic of this field that the investigators speak excitedly of beautiful colors, queer phenomena and explosive events."

Kroger Plans Storage Unit

KROGER CO. is planning to start construction soon on a $5,000,000 warehouse and office building on a 47-acre site in Solon, to serve its 71 stores within a 100-mile radius of Cleveland. It will replace the existing facility at 5700 Truscon Ave., S.E., Cleveland, which will continue in operation as a Kroger bakery. Included in the warehouse will be areas for below-zero freezers for frozen foods, an air-conditioned section for produce; special "wet" and "dry" refrigerated rooms for produce. Modern offices, air conditioned, will be at one corner of the building. The present warehouse in Cleveland was built in 1927.

Nuclear Energy Committee Named By Air Conditioning Society

BECAUSE of the interest in nuclear energy and how it may affect the heating and air-conditioning industry, a Nuclear Energy Engineering Committee has been formed by the American Society of Heating and Air-Conditioning Engineers. This was announced by President John W. James at a recent meeting of the Council of the Society.

The chairman of this committee is Ralph A. Sherman, Columbus, Ohio, Treasurer of the Society and technical director, Battelle Memorial Institute. Serving on the committee with him are Walter F. Friend, New York, N.Y., Ebasco Services, Inc., Walter A. Grant, Syracuse, N.Y., vice president, central engineering stag, Carrier Corporation, L. N. Hunter, Johnstown, Pa., vice president engineering and research, National-U.S. Radiator Corp., Burgess H. Jennings, Evanston, Ill., professor and chairman, department of mechanical engineering, Northwestern University.

According to Mr. Sherman, one of the objectives of this committee will be "to keep abreast of developments in nuclear energy affecting the heating and air-conditioning industry and to serve as the principal source of information in this field for dissemination by the Society."

Packing Plant Destroyed

FIRE blazed spectacularly from the boiler room midsection, of the Northwest Packing company's No. 1 plant and general offices, Portland, Ore., destroying the block-square building and doing an estimated $1,500,000 damage. Firemen fought the two-alarm blaze for more than two hours before bringing it under control. There were no employes in the plant, located at 554 N. Columbia Blvd. and no injuries reported among firemen. The firm packs dog food, beans and strawberries and currently has been packing dog food, of which a pack estimated at $500,000 was lost.

Cause of the fire was not immediately determined, but some employes believed it might have come from the electrical system, since boilers and other cooking devices were closed for the week end.

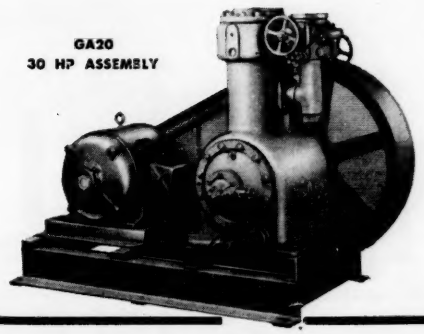
Air Conditioners Charged For Non-Conserving Water

A SPECIAL demand charge for users of certain types of air conditioning has been approved by the Board of Water Commissioners, Detroit. The charge will apply to those who use air-conditioning systems which do not conserve water.

Those who install such systems this year will pay a demand charge of $7.50 a ton a year. Units already installed will be billed $1.50 a ton a year, increasing $1.50 a year until the $7.50 maximum is reached. Gerald Remus, general manager of the Water Board, said: "This is not a tax but a demand charge for special loads such as is charged other utilities." First billing of the new charge will be in 1957, he said.

Explosion Wrecks Ammonia Plant

AN EXPLOSION shortly after midnight wrecked the Sun Oil Company's new ammonia plant at its Marcus Hook, Pa., refinery, injuring eight persons and causing damage estimated at three million dollars. The blast shot flames 200 feet into the air. Shock waves were felt within a radius of 20 miles, according to a news report.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HOLDS INSTALLATION COSTS WAY DOWN!

HOWE AMMONIA COMPRESSOR ASSEMBLIES, in capacities to 50 H.P. in both Standard and Booster models, are now factory assembled on steel base with drive and electric motor.

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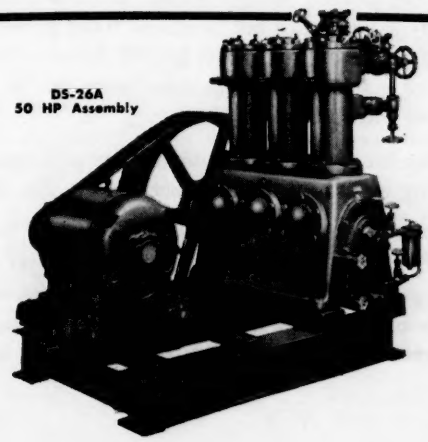
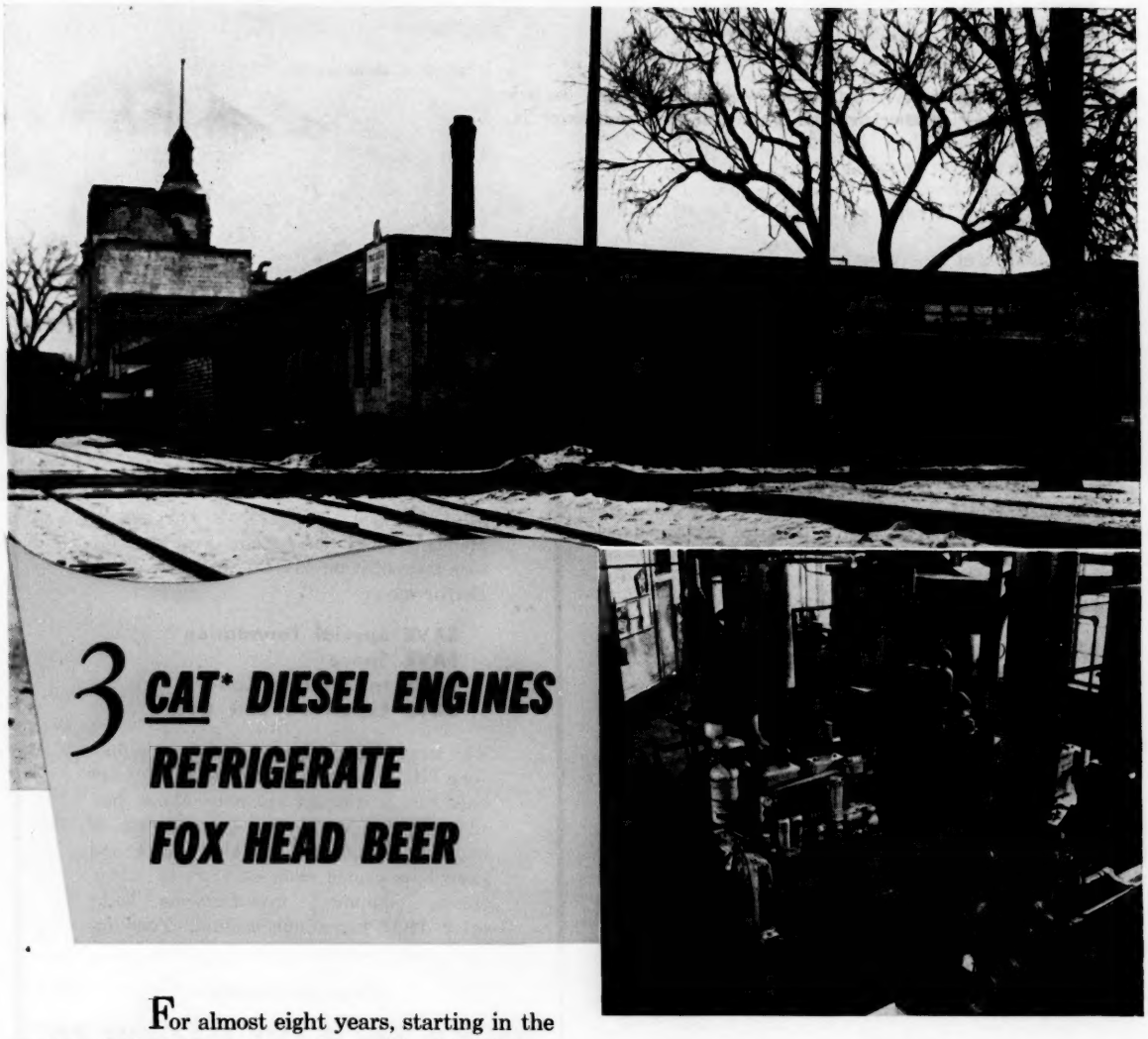
SINCE 1912, manufacturers of ammonia compressors, condensers, coolers, fin coils, locker freezing units, air conditioning (cooling) equipment.


DS-26A
50 HP Assembly



3 CAT* DIESEL ENGINES REFRIGERATE FOX HEAD BEER

For almost eight years, starting in the spring of 1948, these three Caterpillar D8800 Engines have handled all refrigeration at the 250,000-barrel plant of Fox Head Brewing Co., Waukesha, Wisconsin.

The brewery had previously used steam. When the bulky boilers were replaced, the Cat Engines not only saved space but produced more power *and* flexible power as well. Each D8800 drives a 50-ton Frick ice machine, and the three units can be used singly or together, as required.

After long service the engines are still running smoothly and the chief engineer reports Fox Head is "very well satisfied."

For plants that need dependable power, the Caterpillar line offers diesel engines with outstanding advantages. The new D339, for example, delivers more horsepower than the D8800, yet is the same size and weight, with the same famous Caterpillar stamina and economy.

Your Caterpillar Dealer is a good man to talk to when you have a power problem. He can supply a full range of diesels up to 520 HP. And his excellent parts and service facilities protect the long, profitable work life that is built into them.

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MODERN HEAVY-DUTY DIESEL POWER

In the Spotlight

HOTEL utility requirements stagger the imagination of the layman. In this issue, in article starting on page 25, the steam, electric, water, refrigeration and other utility demands are recited. Conclusions of the reader will undoubtedly be to the effect that the engineering department in this field is as important to a firm's success as in other refrigerating businesses. Air-conditioning is further complicating the tasks and responsibilities of the hotel engineering department. This article by Leo Gage describes the new plant being added at the Detroit Statler — all without interruption to service.

HEAT PUMP system for warm or cool air conditioning has been announced by the York Corporation. First application of the new device is functioning in a department store and another is being installed in a new office building. With expected development of atomic energy as electric power source, the heat pump could achieve more favorable economics in operation than it does at present. The new system is described in article starting on page 13.

ANTIBIOTICS as an agent for preserving fish and other meat products is being used with ice, according to reports from chemical companies supplying the process. Claim is made that top quality of freshly caught fish can be prolonged as much as a week. In a joint research venture the Cape Pond Ice Company and Chas. Pfizer & Co., New York chemical concern, are supplying Gloucester, Mass. fishermen with ice incorporating Biostat, a food grade antibiotic. For a survey of the subject, see article starting on page 19.

SMALLER refrigerating plants may be overlooking improvements in efficiency through inexpensive devices offered today. On page 17 is a story of how a 90-year old brewery cut compressor capacity by one-third with the addition of a liquid return system, a new larger accumulator and two new liquid lines. Practical owners, managers and engineers will be interested in this informative article.

TRADE RULES for refrigeration and air conditioning contractors have been formulated by The Federal Trade Commission, dated May 8, 1956. The rules do not apply to manufacturers, wholesalers and others engaged in the sale of air conditioning or refrigeration equipment, except to the extent that they install such equipment or systems. The complete text of the rules is published in the article starting on page 21.

ALFORD Refrigerated Warehouses, with 15 million cubic feet of storage space, is adding a half-million cubic feet of freezer space. This is a huge development built by Fred P. Alford in 1947-48 and already this addition is required to take care of the immense storage requirements. For details see article on page 16.

ANALYSIS made by the Industrial Commission of the State of Florida frequency of injuries in the Florida Ice industry show that May is the most dangerous month of the year. Accidents in the industry tend to increase in the spring, reaching a peak in May, then dropping off until the heat of summer arrives when they tend to increase again. See article on page 49.

INVENTOR Jack Watkins contends that many improvements can be made to the conventional compression refrigeration systems, without encouraging the rank and file of equipment manufacturer to jump into science-fiction developments. He supports this contention with descriptions of accessory equipment developed in the last few years, such as liquid recirculation, liquid return, liquid pressurizer, spray chilling, hot gas defrosting and flash gas economizer systems. Read what Watkins has to say about economies effected in small to medium size plants, on page 29.

STANDARDS for water cooling towers for use with air conditioning and refrigerating equipment have been released by the Air Conditioning and Refrigeration Institute. For details see announcement starting on page 55.

NAPRE's President selects a report each month for its best news and/or educational contribution, and honors that Chapter scribe for his effort. Pittsburgh and Otto Knoch took the spotlight this month for the report of a field trip through the 4500 ton central station air conditioning plant of Pittsburgh's new and highly-publicized Three Gateway Center buildings. See page 37 for report on trip.

LETTERS

Another Pleased Reader

Cincinnati, Ohio

YOU may imagine how pleased we were to receive the February issue of INDUSTRIAL REFRIGERATION with description of our "baby", the Hilton Davis plant and its picture on the cover. This plant was a real challenge. It has, as a result of its success, led to a repeat order for an additional 24-ton latent heat storage plant for further cooling. This time it is to be for chilling of jacket water. We note in this same issue an article by Karl O. Werwath on The Technological Age in Refrigeration.

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Standard for ice freezing tanks and ideal where multiple can lifts are used. Large gas liberation area and rapid circulation of brine makes this a very efficient unit.

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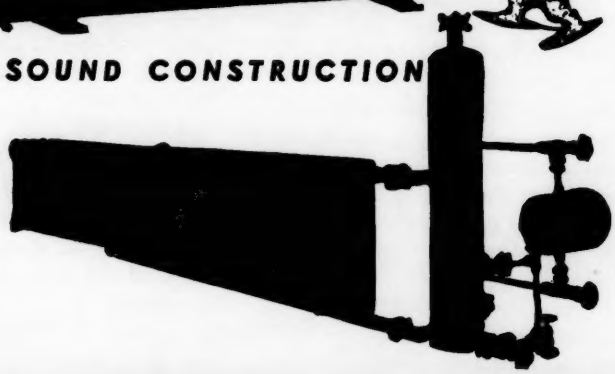

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New Application of Heat Pump System Provides Warm or Cool Air Conditioning

A NEW single heating-cooling plant that will provide warm air for winter and cool air for summer is the promise held out by new developments of the heat pump principle by the York Corporation. The announcement of this development was made at a press conference held in New York by the York Corporation April 30. The announcement stated that this is the first practical system of heating a building without fuel by using below freezing outside air as a heat source. The announcement was made by Ray K. Serfass, a vice-president of the corporation and general manager of York's Industrial Division. He explained that York has applied for patents on a heat pump system capable of heating a building using freezing or below freezing winter air processed by the same refrigeration system used to cool the building during the hot summer months. No supplementary heating system is necessary.

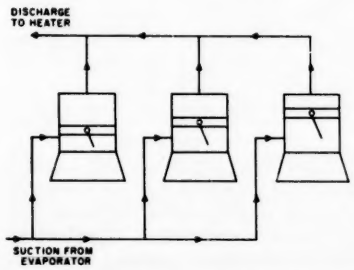


Fig. 1—Simplified schematic flow diagram of a conventional heat pump utilizing single stage compression. For summer cooling, or for heating in temperate climates, single stage compression is adequate. But in weather much below freezing, the compression ratio rises to a point that makes single stage compression impractical for developing enough heat — requiring the use of supplementary electric strip heating.

The first application of the new system is functioning in a department store and another is being installed in the new office building of an architectural and engineering firm, Mr. Serfass said. He said that the economic aspects of this development should have significant international implications. "Any country in which electric power is available can now heat as well as cool its buildings by using air as a direct heat source rather than coal, oil or any other fuel.

"In addition to future savings of untold millions of dollars in direct fuel costs through use of this development, its application should result in an easing of the drain on some of our most valuable natural resources, which must presently be used to supply heat," he said.

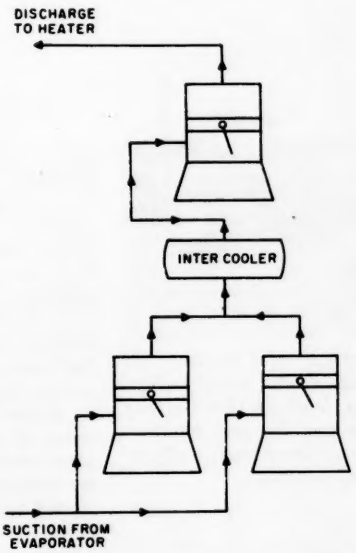


Fig. 2—Compound, or multi-stage compression, shown above in a schematic diagram, is used in new heat pump system to lower compression ratios and increase output during very cold weather, thus providing comfort heating of a building without the use of any supplementary heating. The new compound compression heat pump system automatically switches from single stage compression to compound compression when the outside temperature drops below a certain point.

The announcement comes after a 104-year search for an economical and practical heat pump. First conceived by the British scientist Lord William Thomson Kelvin in 1852, the heat pump has been the subject of many millions of dollars of research in the intervening years. Although a number of leading companies, including York, have developed various types of heat pumps in the past few decades, no one previously has been able to create a heat pump that could operate economically using outside air at temperatures much below freezing. With outdoor temperature colder than this, expensive supplementary electric resistance heating had to be used to warm the building. This fact relegated practical use of the air source heat pump to the more temperate climates.

Water Units Now in Use

Mr. Serfass pointed out that a number of successful units installed by York, employ the heat pump principle, but use water as a source of heat, dating back a quarter of a century or more. In the early 1930's, York heat pumps were used to air condition a number of office buildings, including those of the Gulf States Public Utilities at Beaumont, Texas; the Louisiana Power and Light Company at Algiers, La.; the Atlantic City Electric Company at Salem, N. J.; the American Gas and Electric Company at Pitman, N. J., and the Metropolitan Edison Company at Reading, Pa.

In operation in private homes, there are hundreds of York heat pumps using water from the sea or from shallow wells, particularly in milder climate areas. There are also over 25,000 heat pump room air conditioners of various types in use throughout the country.

This new development, however, does away with the need for readily available well or sea water or any supplementary heating by making use of a long known refrigeration technique — compound compression — which has been used for years to achieve economically the extremely low temperatures used in ice cream plants and the frozen food industry, according to Mr. Serfass.

He said that the compound compression principle, ingeniously applied to the air source heat pump for the first time by Robert G. Werden, a 40-year old York sales engineering executive, may be one of the significant developments in the history of year round air-conditioning.

The heat pump system developed by York automatically heats or cools the room in a building, depending on the climatic conditions, and al-

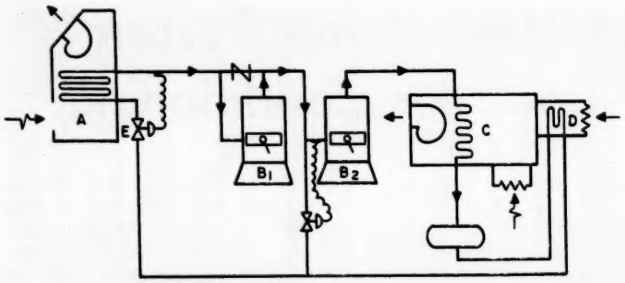


Fig. 4—Schematic diagram of two stage compression heat pump system with liquid sub-cooling.

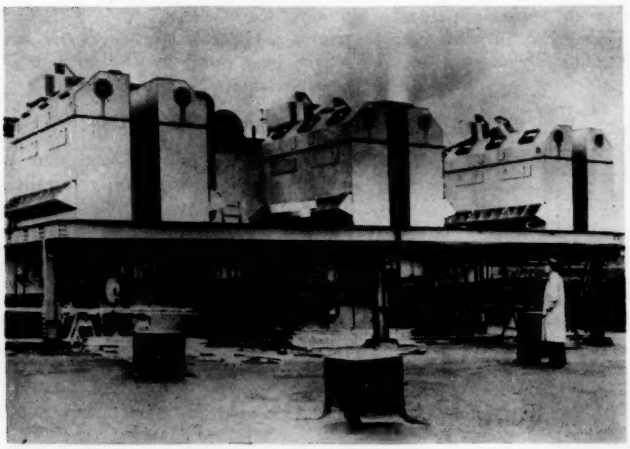


Fig. 6—The six units resting on structural steel dunnage do double duty in new compound compression heat pump system. In winter, these units serve as air coolers, while in summer they act as evaporative condensers. During below freezing weather, specially designed refrigerating coils inside these units cool the frigid air to still lower temperatures.

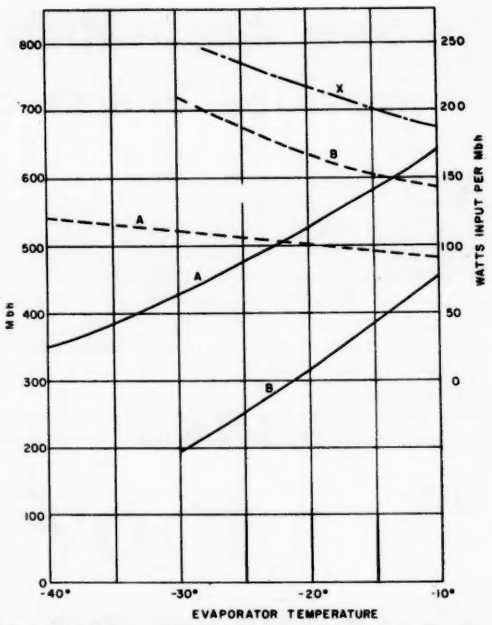


Fig. 5—Chart shows heat produced and wattage expended by new heat pump system as compared to conventional single stage systems. At minus 20F evaporator temperature, solid line A, representing York compound compression system, produces 67½ per cent more heat than solid line B (conventional system). At the same time, new system (dotted line A) while producing 1000 Btu's per hour at 110 degrees condensing temperature for 100 watts (compressor only), is using far less energy than is a single stage system, represented by dotted line B, which uses 167 watts. Furthermore, if the single stage system were to be supplemented by direct electrical strip heat to produce the equivalent heat output represented by scheme A, the total watt input of the single stage system plus the strip heat raises the input to about 230 watts, shown by dotted line X.

ways provides the desired room temperature. Thermostatically controlled valves guide the hot or cold water flow in and out of the system while the compressors automatically move from single stage compression into compound compression when the temperature drops below a certain point.

With the expected development of atomic energy as an electric power source in the foreseeable future, Mr. Serfass said that the York heat pump could well achieve even more favorable economies in heating costs than it does at present. In addition, in new structures equipped with air conditioning as a matter of course, the York heat pump will mean a saving in valuable space, since the basic refrigeration system for cooling in summer will also provide the winter heating.

TABLE SHOWING COEFFICIENT OF PERFORMANCE — COMPRESSORS ONLY

EVAPORATOR TEMPERATURE	1 STAGE WITHOUT SUBCOOLING	1 STAGE WITH SUBCOOLING	2 STAGE WITH INTERCOOLING	2 STAGE WITH SUBCOOLING
-40°	—	—	2.16	2.69
-30°	1.55	1.77	2.34	2.96
-20°	1.95	2.30	2.60	3.25
-10°	2.27	2.73	2.81	3.56

Removes Heat From Air

Using only the electricity needed to run the compressors, which form an integral part of the basic refrigeration unit, the York heat pump can remove heat from zero degree outside air while cooling this air to still lower temperatures as it passes over specially designed coils. The heat removed by the refrigerant from the outside air, is elevated to a usable temperature level by the compression cycle. This heat can be used to produce hot water, which can be circulated throughout the building in an indirect system, or the hot refrigerant can be used directly in coils to provide forced warm air heating through either a central unit or multiple units.

During warm weather, conversely, the expansion, or cooling of the refrigerant as it turns from liquid to

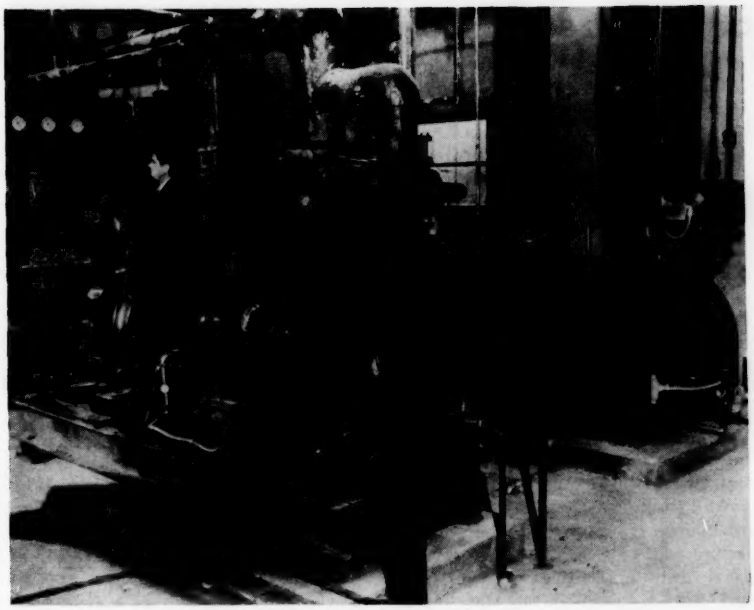


Fig. 7—Reciprocating compressor (foreground) for high stage operation and rotary low stage compressor (right) form one of the three York compound compression heat pump systems in the Heironimus Department store in Roanoke, Va. Each system has its own gauge board (left) which indicates refrigerant pressures.

gas, extracts heat from the water circulated through the refrigerant. The resulting chilled water is piped to the same coils and cools air blown through these coils.

Two new buildings are now using, or being equipped with the new York heat pump system. The Heironimus Department Store, in Roanoke, Virginia, was completed this month. The Ballinger Building in Philadelphia, new home of the Ballinger Company, one of the nation's oldest architectural and engineering firms, will be completed in June.

Although York is supplying the new heat pump to industrial and commercial buildings at the present time, Mr. Serfass said that the company's research and engineering departments are currently working on the miniaturization of the system into packaged units to make home use of the heat pump practical at some future date. If this work progresses satisfactorily, he said that there is a possibility that a practical and economically feasible heat pump system could be ready for home heating and cooling sometime during 1957.

Research and Development Committee Meets

ONE of the two committees which now steers the National Ice Association's Research and Marketing work, the Research and Development Committee, held its first meeting at the Sherman Hotel, Chicago, March 19. The other Committee, the Sales and Marketing Committee, is scheduled to meet in a few weeks. This was the initial meeting of the Research and Development Committee. All members of the Committee were present.

The purpose of the meeting was to review the research and development work which has been undertaken over the past ten years and to start formulating a new program aimed at the future needs of the Industry. Among other topics, the following fields were analyzed and discussed: Ways to improve and extend the use of the RS type of ice-cooled railroad refrigerator car; problems of and profits to be made from distribution of Dry Ice, and the exploration of using small amounts of dry Ice with water ice in railroad cars and motor trucks to retard certain types of deterioration in perishables, methods of improving the layout and equipment of ice processing and handling operations to reduce labor cost, the use of antibiotics, such as the new "Acronize" developed by American Cyanamid, for use in slush cooling tanks for poultry processing plants and elsewhere.

Vacuum Cooling Increases

VACUUM-COOLING as a means of preserving agricultural produce has progressed to the point where vacuum chambers large enough to accommodate a loaded refrigerator car or truck trailer have been constructed. A report summarizing research data on this process has been issued by the U. S. Department of Agriculture.

Vacuum-cooling was first used commercially in 1948. The process, over-simplified, is one in which air is pumped out of a vacuum chamber in which the produce has been placed. Evaporation of water from the produce cools it. Successful development of vacuum-cooling has permitted marked changes in handling lettuce, researchers report. Use of this method eliminates need for a packing house, as lettuce can be packed in shipping containers in the field. When precooled by this method, lettuce in transit requires only bunker icing, which means more lettuce can be shipped per car. Vacuum cooling has reduced lettuce packing and shipping costs by an estimated 25 percent, researchers say.

Spinach, coleslaw, and mixed salad can be vacuum-cooled after the produce is bagged and packed in master containers. Cooling these perishable commodities helps to reduce spoilage.

Vacuum-cooling is a rapid operation. Commercially, it cools lettuce in about 30 minutes; prepackaged leafy vegetables in about 15. Researchers say further investigation may prove the process suitable for other items, such as strawberries, mushrooms, sweet corn, and possibly celery.

The initial investment for vacuum-cooling equipment is high and operation over a long time would be necessary to justify the cost. Plants for cooling lettuce have been built in California, Arizona, Texas, Wisconsin, and Canada.

New Vacuum Cooling Plant

OPEN HOUSE for agricultural leaders marked the inauguration of the first vacuum-cooling plant for fresh produce to be established at Santa Ana, Calif., in Orange County, with R. J. Hoening and John H. Gabriel of the Crystal Ice Co. as hosts. The new plant, located in an industrial tract on Harbor Blvd. at the north edge of the former Santa Ana Army Air Base, will have a capacity for precooling an average of 10 freight carloads a day.

Large Warehouse Adds Freezer Space

AN OPEN area at the south end of its 8,500,000-cubic-foot cold storage building is being enclosed by Alford Refrigerated Warehouses of Dallas, Texas for additional freezer space. Gunnite walls are rising around an area (already roofed over) that is 160 feet long, 150 feet wide and 25 feet high. Thus, more than a half acre or more than a half million cubic feet of freezer space will be added.

"We also are considering plans for additional dry storage space," President Fred F. Alford disclosed. "In recent months we have operated at over 90 per cent of dry storage capacity."

The Alford warehouses at 318 Cadiz Street, one for cold storage, the other for air-conditioned dry storage, are virtually twins in size and outside appearance. The single-story, sprawling giants are situated on a 20-acre tract only one mile from downtown Dallas and accessible by a network of highways and railroads.

Employees Erect Building

Doing the space-stretching on the cold storage building are members of Mr. Alford's own maintenance and engineering crews. It was these same men, trained by the boss in construction work, who in 1947-48 put him up a layout worth $12,000,000 but costing only about $4,500,000. These savings were effected through some then revolutionary ideas of Mr. Alford's about warehouse construction and operation.

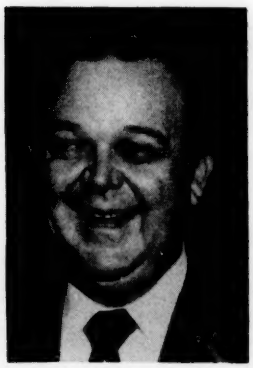
Mr. Alford learned warehousing about 20 years ago by accident. An ex-farm boy who became an accountant, he was sent to Dallas by his firm in 1936 to run an audit on the Merchants Cold Storage Company, in difficulty in a rundown multi-story building on Broom Street.

He ended up by operating the plant itself, as a sideline, later giving away his accounting business. Turning to mechanization, he put the business on a sound basis, created an employee loyalty by practicing the Golden Rule, then began to dream of the type of warehouse he figured the booming Dallas-Fort Worth metropolitan area should have.

He acquired his location, alongside Industrial Boulevard and beside the tracks of the Rock Island Lines, which has mutual switching privileges with all other railways serving Dallas. The site is readily accessible to all parts of the city and to outgoing highways. This position will be further enhanced by projected construction of a system of freeways and expressways.

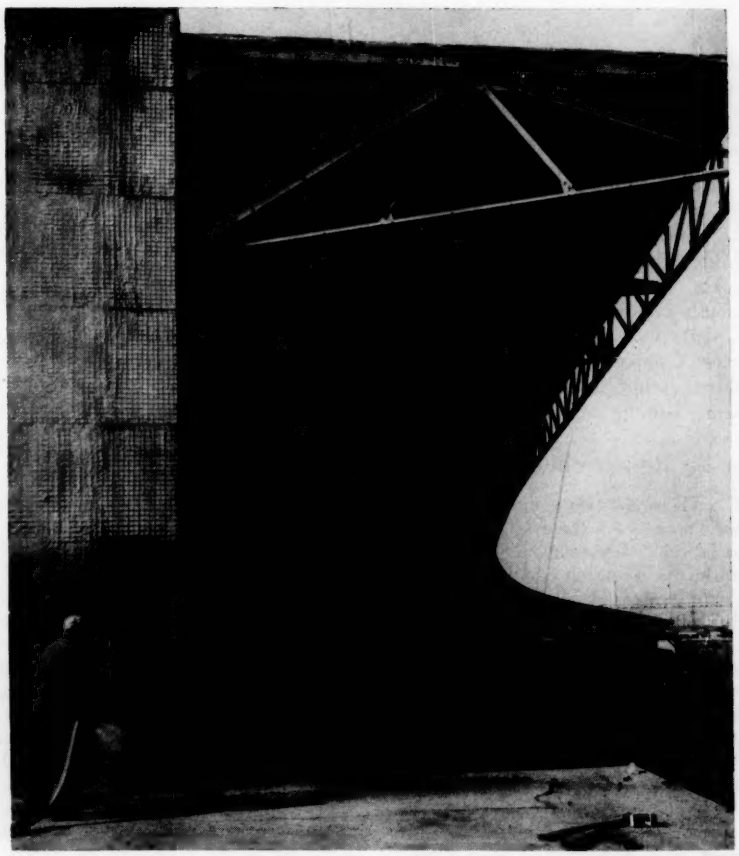
Mr. Alford called in industrial architects and engineers, but wrangled with them over design and function, then dismissed them, deciding he could do better on his own. An example of his unorthodox thinking, which proved sound: In cutting construction corners, he stoutly declared it unnecessary to insulate the floors of refrigerated areas. And he used redwood bark instead of cork in wall insulation.

And pulling some of his own men off nonconstruction jobs in his other Dallas warehouses, he trained them as steelworkers. Result of this was that steel framing of the warehouse rose at a cost of $7.50 a ton instead of the $27.50 a ton going rate of that time.



Fred P. Alford
President Alford Refrigerated Warehouses, Dallas, Tex.

Alford workers take pride in the fact that they built their own plant, and a generous management plan which includes payment of medical expenses, guaranteed annual wages, $4,000 college scholarships to employees' children whose high school grades are good, and many other benefits make them loyal members of the "Alford Family."



Alford maintenance crewman sprays cement to form wall around new freezer space being added. Alford workers erected the sprawling, 15,000,000-cubic-foot Alford warehouses at 318 Cadiz Street, Dallas, in 1947-48.

Ninety Year Old Brewery Cuts Compressor Use Oshkosh Installs NH_3 Return System

Oshkosh Brewing Co. in the Wisconsin city also known for its luggage for several generations celebrated 90 years of brewing activity in May. Brewers of Chief Oshkosh beer, a pilsener, the firm held open house daily from May 22 through 26, serving fine lunches and refreshment to friends who called. The story here was highlighted for IR's staff by NAPRE member Lester Winkler, Oshkosh's Chief Engineer.

IMPROVEMENT of plant operating efficiency is one answer the small operating firm or business enterprise can have to the increasing competitive field in his product line. The small food or beverage processor invariably has some short-coming in his production arrangements, engine room performance or other departments that can be improved upon with minor changes or by the addition of relatively inexpensive equipment. Oshkosh Brewing Co. recently completed the installation of a liquid return system. The addition of this system and its associate equipment allows operation of less compressor capacity and promotes a more favorable plant operating program.

Smaller businesses outside metropolitan areas have found competition with their bigger business counterparts increasingly difficult. Although larger enterprises are invariably faced with a higher priced labor market, consolidation and mergers and the disappearance of smaller firms attests to the highly organized marketing facilities, the purchasing power and capital investment advantages of the bigger firms. Therefore, small producers must avail themselves of the latest knowledge of process, quality control, newest engineering techniques and modernized materials handling.

This is true of the small beverage producer. He must find methods of applying latest developments to his operations without large handicapping capital investment in new equipment, or in building alterations or new construction. The recent addition of the Type "G" Phillips liquid return system at the Oshkosh Brewery is typical of what a smaller firm can accomplish in a refrigeration plant to improve plant efficiency and at the same time avoid large capital outlays for increased production.

Refrigerating Equipment

Annual production of this Wisconsin brewery amounts to 75,000 barrels of pilsen beer. Refrigeration equipment used for wort cooling, beer cooling and cellar refrigeration consisted of an ammonia system utilizing three compressors. One machine was a 75-ton horizontal double-acting 15 x 30 in. steam-engine-driven unit operating at 54 rpm. A two-cylinder 8½ x 8½ in. vertical single-acting Vilter compressor which developed fifty tons at 300 rpm was another important unit of this system. It was added to the plant several years ago but had been used sparingly due to danger of liquid slugging. The third is a 25-ton 9 x 15 in. horizontal double-acting Vilter unit with a steam engine that operated at 80 rpm.

Although the system was equipped with a 24-in x 8 ft. receiver, no provision had ever been made for a low pressure trap or receiver to knock out wet gas or slop-over. The gas returned to the horizontal machines with a considerable amount of liquid. Suction and discharge both appeared to be rather wet, as discharge temperatures from the machine often read 60 F at the packing end and 80 F at the head end of the refrigerant cylinders.

Condensing water at 55 F was taken from the firm's wells thru the condensers and then into the house tanks. Approximately 100 gpm is used in the house of which 50 to 75 gpm is via the condensers, the exact amount of course depending upon the refrigerating load.

The system used a single liquid line to all services in the plant, necessitating shutting off equipment at the point of use when those items were not practically applicable for production at any specific moment, or when one of the processes was overloaded and required suspension

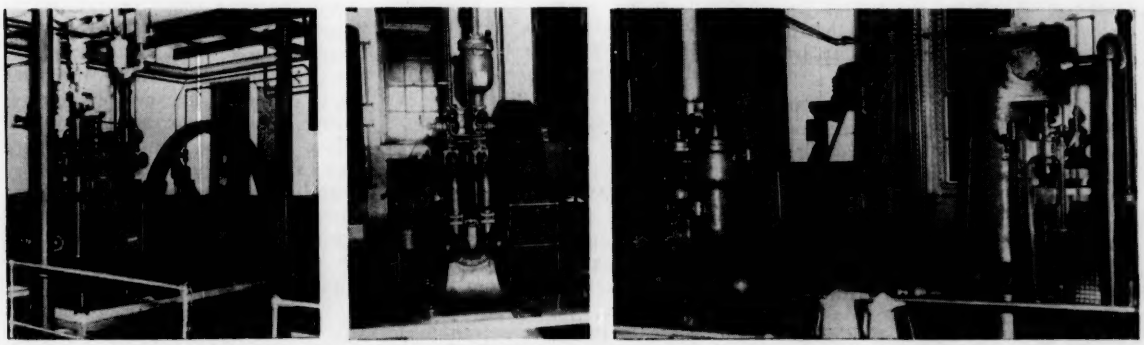
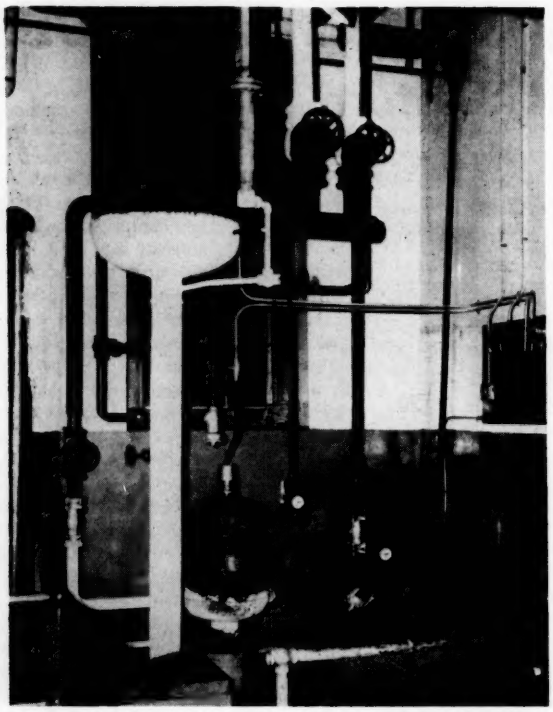


Fig. 1 — At left is pictured a 75-ton horizontal double-acting ammonia compressor used in the Oshkosh Brewing Co. plant at Oshkosh, Wis. In the center photograph is a Vilter horizontal double-acting machine rated at 25-tons, which is also driven by a steam prime mover. At right is the third unit making up the complete compressing facilities of the brewery. This is a Vilter two-cyclinder vertical single-acting unit capable of being driven either by the steam engine pictured or by a stand-by electric motor. Belts for the motor drive are visible in the foreground. Five minutes is all that is required to make the changeover which completely isolates the steam engine.



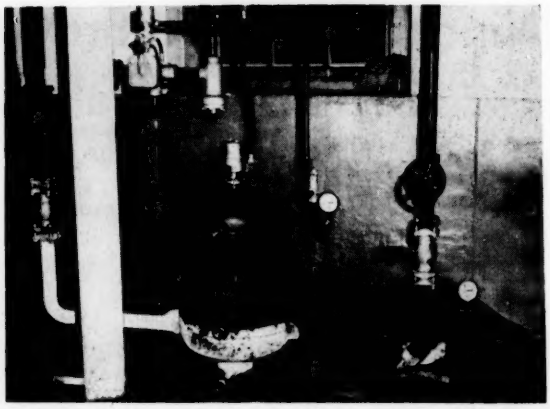


Fig. 2 (left) — New accumulator and liquid return system trap and pump installed at the Oshkosh Brewing Co. This unit is claimed to have helped the firm reduce their compressing requirements by one-third. The panel at the right controls this Phillips Type "G" system and includes precautionary alarms.

Fig. 3 (above) — Closeup of the 3-way valve, liquid trap and Viking pump described. Note the "Level-Eyes" installed in the liquid trap. This patented device indicates solid black when any liquid is behind it, and is a near-white opaque indicator when there is no liquid present behind it. Note the check valve in the liquid inlet to the trap and the discharge from the pump.

at a less delicate point. When operating at maximum production, the 75-ton compressor was used for wort and beer cooling, and working cellars. Storage cellars were secured from the system until wort or beer finishing operations were completed. Then the 75-ton machine was secured and the 50 and 25-ton machines were run to hold the cellars between operating periods.

Chief Engineer Lester Winkler investigated methods of liquid return at his plant, convinced that one of several systems being currently marketed would probably help the plant considerably. Upon his recommendations, the Oshkosh Brewing management selected the system described herein. Winkler states that it has cut his compressor capacity by one-third.

A new 30 in. x 10 ft. receiver was installed together with two new liquid lines and the associated piping necessary to the high-side of the system, and for trapping out liquid on the low-side and returning it to the high-side of the system. An American Boiler Co. accumulator with a McKinnes high level alarm were provided and tied into the Phillips Type "G" system. Phillips also provided a trap equipped with "Level-Eyes" and a "Viking" pump to complete the principle components of the system.

Hot wort cooling dumps 10 gallons every 15 minutes, and beer finishing and cellar operations return about 10 gallons every 45 minutes. In operation, the Phillips system transfers approximately 12 gallons at an average of 15 minute intervals, from the low-side accumulator to the new receiver. Rapid cycles can be accomplished in three minutes. Two suction lines return to the accumulator; one, the larger, from the processing operations, and the other from the storage cellars. Liquid accumulates and when it reaches a predetermined point, any additional liquid will overflow into a smaller trap located below (see Fig. 2 and 3). The smaller tank is vented through a 3-way valve back to the accumulator, which allows a gravity flow. As liquid accumulates in the smaller trap, it actuates an electrically controlled float. Successively, the float changes the position of the 3-way valve, equalizing to the high-side receiver and starts the Viking pump which discharges the liquid to the high-side receiver.

As the level in the small trap is reduced, the float again shuts off the pump and re-positions the 3-way valve to again vent the trap to the accumulator. Appropriate check valves are located in the trap inlet and the pump discharge to prevent any back flow of either gas or liquid from the trap or from the high pressure receiver, respectively.

Additional floats are provided and hooked up to alarm systems should other control equipment or the pump fail. Piping is arranged so that the liquid return system may be bypassed. The two new liquid lines which are operated from the engine room, supply wort and beer cooling operations from one branch and the cellars from the other. Either operation can be isolated now from the engine room.

Water Heating Improved

Since the system has been installed, according to Chief Engineer Winkler, discharge temperatures from his machines have been in the neighborhood of 240 F, and the gas is dry. Since condensing water is used in other plant operations requiring the water to be heated in three hot water tanks with plate coils and four psig waste steam, the plant is receiving an unexpected improvement in the water heating system. More important, however, Winkler relates, is that under maximum demand he now uses 50-and 25-ton compressors in combination to perform the same work previously done by a combination of the 75-ton unit and one of the other two.

When there is no processing in the plant, and the cellars are the only load, the 25-ton machine will adequately handle the load. Previously this application had required a 50-ton machine and on occasions a combination of both. Practice now

(Continued on page 50)

Antibiotics as Preservative of Fresh Fish and Other Meat Products

THE prospect of fresher fish for consumers and more profit for fishermen was held out to industry representatives in Miami April 18 for the annual meeting of the National Fisheries Institute.

Dr. Wilbur H. Miller of American Cyanamid Company said there is widespread and convincing evidence that the revolutionary concept of using antibiotics to preserve food can be effectively applied to the fishing industry. Dr. Miller, who is Director of Industrial Applications for the company's Fine Chemicals Division, reported that a new antibiotic process, is being used to preserve fresh-killed poultry and work is going steadily forward to extend the benefits to fish and possibly to such commodities as beef, pork and lamb. The process increases the consumer appeal of poultry and may have similar effects in the fishing and other meat industries.

Freshness Prolonged

Research has now reached a point where the top quality freshness of scrod haddock, halibut and salmon can be prolonged as much as a week, a significant period when considered in terms of its effect on shipping, shelf life and consumer appeal, said Dr. Miller. The speaker said other experiments have been carried out with marked success involving black bass, red snappers, weak fish, sardines and shucked oysters.

"The results of our various trials agree with the possibility of landing fish which have greater freshness and more uniform quality," said Dr. Miller, "even though these fish are obtained from areas which may be somewhat farther from present ports."

Dr. Miller explained the process is based on a simple formulation of the antibiotic Aureomycin chlortetracycline. He said only trace amounts of the antibiotic are used and their effect is to retard the action of bacteria which cause spoilage.

The speaker said the formulation was devised to fit as easily as possible into present ways of handling various food products. "For fish," said Dr. Miller, "we have devised ices, dips and sprays containing chlortetracycline." He explained that, for poultry, a dip or bath is used while, for beef, infusion methods are used for getting the antibiotic into the carcass and sprays are used to combat bacteria on the surface.

Dr. Miller cited one trial involving salmon caught in waters off the state of Washington. As they were caught and eviscerated, some fish were placed in ordinary ice and some were put in ice containing minute quantities of Aureomycin, only five parts per million. These fish then were shipped cross country to New York in commercial refrigerated cars. "On arrival," said Dr. Miller, "the contrasts in color and odor were readily apparent."

The speaker expained that the salmon stored in ordinary ice not only had a slight off-odor, but they also were lighter in color with brown discolorations throughout. The salmon shipped in chlortetracycline ice had a fresh, sweet odor and a uniform pink color. "The estimated extension of shelf life due to our antibiotic ice was about one week," said Dr. Miller.

Start of Research

The speaker said research into the use of antibiotics for food preservation started when Dr. H. L. A. Tarr of the Pacific Fisheries Experimental Station in Vancouver, Canada, tested the effect of penicillin on spoilage bacteria in 1944. As new antibiotics were developed, Dr. Tarr and his associates tested them. In 1954, the Canadian scientist reported Aureomycin was most effective of 14 antibiotics he had tried and, last year, he concluded Aureomycin was five times as effective against spoilage bacteria as any other antibiotic now available.

Armed with this evidence, technical men sought to determine methods whereby the antibiotic could be applied to foods. A prime requisite of this search, according to Dr. Miller, was safety. Medical literature supplied volumes of evidence that Aureomycin was safe, even when used in much greater quantity by humans. Records of the antibiotics use in promoting growth and lessening disease when used in animal feeds also attested to Aureomycin's safety.

Despite this vast amount of evidence of the antibiotic's harmlessness, the U.S. Food and Drug Administration acceptance of the process for poultry is based on the fact that none of the antibiotic remains in the food after cooking. As an added safety factor, Dr. Miller said American Cyanamid Company is requiring strict sanitary standards be maintained before a poultry processor is franchised to use the process.

Aids Fish Industry

In another discussion of this subject, Jack D. Langlois of the Food and Beverage Department, Chas. Pfizer & Co. Inc. said that based on rapidly accumulating experimental results, it is becoming increasingly more evident that a few selected antibiotics used in conjunction with present day storage technique and without significant changes in commercial procedures, can make a great contribution to the economic well being of the frozen fish packer, the canner, and most important to those who are primarily involved in marketing fresh fish.

There are a number of different methods by which spoilage occurs, he said. Of primary concern to the fish industry is bacterial spoilage, for it is this type that results in the most serious economic losses.

Chemical companies, and in particular those chemical companies who have been leaders in the development of fermentation products, have for the past 15 years been intimately associated with the development, testing, and marketing of commercial antibiotics. In recent years attention has been directed more and more toward the development of food grade broad spectrum antibiotics which in very minute quantities would extend the storage life of fish as well as other foods in the fresh state by effectively inhibiting bacterial growth.

Bacterial Spoilage

Bacterial spoilage begins as soon as the fish are caught. Present methods of icing fish on board fishing vessels are designed to slow down the multiplication of bacteria. Antibiotics such as oxytetracycline accomplish the same purpose. However, he warned that it is the combination of low temperature storage plus antibiotics and proper sanitation that will make possible the real extension of shelf life.

As a further precaution against spoilage, they have been able to show that a few parts per million of oxytetracycline added to the tank into which fillets are normally dipped for brief periods will also aid in increasing what they call freshness time. Best results in this latter experiment were obtained when the fish from which the fillets

were taken were previously stored on board with antibiotic ice.

In regard to the cost, Mr. Langlois pointed out that first there is the possibility that the fishing voyage can be extended to cover a greater area and thus make possible a more economical load of quality fish per boat. Second, as a canner faced with a short season and tremendous quantities to process in a brief period of time, it would be possible to level out production peaks and valleys by more normal scheduling. A freezer could guard against accidental spoilage during storage and transit. However, he believes that most important is the opportunity to use at least some of these extra days of freshness time to develop new markets for fresh fish that were formerly out of reach due to distances involved. In every case a better quality product is bound to win new consumer acceptance.

Precautionary Advice

In receiving all of these possible advantages, the speaker issued a warning. By staying at sea an extra four days and in addition shipping to markets four days further away he said, they would in effect defeat the purpose of the use of antibiotics. Thus it becomes of paramount importance that they know the history of the fish caught for their operation. Then evaluate just exactly how they intend to utilize the benefits of antibiotic treatment to build greater consumer acceptance. This is the challenge that antibiotics puts up to the industry, he concluded.

Ice Company Pioneers In Antibiotic Ice Research

THE Cape Pond Ice Company, leading producer of ice for the fishing industry, at Gloucester, Mass. has announced that it will join with Chas. Pfizer & Co., Inc., in undertaking an extensive antibiotics-in-ice research program. The 54-year old ice company, with offices and plants at the edge of the harbor on Commercial Street, will work with the New York firm in incorporating Biostat, a food grade antibiotic, into 300 lb. ice cakes. Biostat, a Pfizer product, extends the freshness time of fish by combating bacterial action.

According to John Ryan, Cape Pond president, this joint research venture is part of the company's continued efforts to bring to the fishing fleet and fish processing firms the latest and most advanced methods for the industry. Mr. Ryan said that arrangements have been made with various fish industries of Gloucester to conduct experiments on the use of Biostat in preserving fish.

Cape Pond delivers ice to the bunkers of fishing boats at rates exceeding 100 tons per hour. This high-speed operation enables boats to "ice up" and put to sea in a minimum amount of time, a vital economic factor when the fish are "running." The fast delivery also enables the company to service many boats in a short time and on short notice.

Offers Economic Boon

Dr. A. S. Malaspina, Pfizer researcher, stated that the use of Biostate should prove an economic boon to the fisherman and the fishing industry. He explained that Biostat can extend the freshness of fish 100 per cent or more and will allow a longer interval between catch and consumption. "This," he said, "will permit shipments for longer distances, opening up new markets for fresh fish."

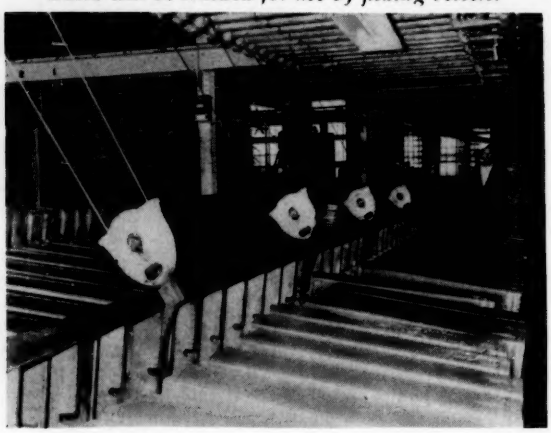
Ordinarily, he explained, all dissolved or suspended particles of antibiotics tend to migrate to a small "core" near the center of the ice block. "This has been eliminated now," Dr. Malaspina said. "Through research it has been found that we can now properly disperse throughout the ice blocks low concentrations of the antibiotic so that when the ice is finally crushed on board boat or in local fish houses and packers, the antibiotic is more fully effective."

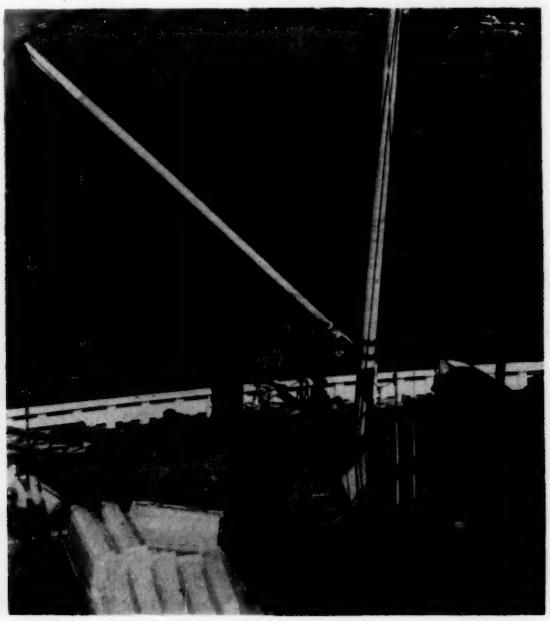
Ice Every Day

Cape Pond, equipped with the most modern of icing equipment, produces ice every day whatever the outside temperature. The plant is currently manufacturing about 150 tons of ice a day. Some of the tanks make a clear block of ice for retail or store delivery; other tanks are used to make "white ice," which later is made into crushed ice for boats for processing fish firms. The plant has electrically operated cranes to service each tank; about 5½ tons of ice are made every 25 minutes. The plant has storage capacity of about 2,000 tons of ice, and machines can crush 50 tons per hour.

Right: Blocks of ice are being lowered into the hold of a New England fishing vessel as it makes ready to put to sea. The ice has been treated with Biostat, which will permit fishermen to stay at sea longer.

Below: Overhead electrically controlled cranes have just released a row of 300 lb. cakes of Biostat-treated ice which will be crushed for use by fishing vessels.





Federal Trade Commission Formulates Trade Rules for Refrigeration And Air Conditioning Contractors

FINAL action on the adoption of trade practice rules governing the sale and installation of refrigeration and air conditioning equipment for industrial, commercial and domestic use was adopted May 8 with the publication of the rules by the Federal Trade Commission which are to become effective 30 days thereafter. The rules govern those persons, firms, corporations, and organizations engaged in the business of refrigeration contracting.

Manufactureres, wholesalers and others engaged in the sale of air conditioning or refrigeration equipment or systems are not to be considered as "members of the industry," except to the extent that they install such equipment or systems.

Window air conditioning units and refrigerating units of a type and size that may be "plugged" into an electrical outlet are not covered by the regulations.

In its statement the Commission said:

Statement of Commission

"Trade practice rules, as hereinafter set forth, are promulgated by the Federal Trade Commission under its trade practice conference procedure. Such rules have application to persons, firms, corporations, and organizations engaged in the sale and installation of:

(1) Mechanical refrigeration units or systems for commercial or industrial use; or

(2) Mechanical air-conditioning units or systems for commercial, industrial, or home use.

"As above used, the word "installation" makes reference to services the performance of which requires engineering knowledge and skill. Thus, window air-conditioning units and mechanical refrigeration units which are of such size and type as to require but a "plug in" to an established electric power system are not to be considered as products to which these rules have application. The words "air-conditioning units or systems" make reference to units or systems which are either capable of lowering, or of both lowering and raising, the temperature of the air within an enclosure and simultaneously effecting a substantial degree of control of the humidity and circulation of the air in such enclosure. Units or systems which are designed to raise, but not lower, the temperature of the air within an enclosure are not products to which these rules have application. The above is to be construed as definement of the nature of activities to which the rules have application and is not intended as definement of the kind of products which may be designated "air-conditioners" or "refrigeration units or systems."

"Manufacturers, wholesalers, and others engaged in the sale of air conditioning or refrigeration equipment or systems are not to be considered as members of the industry except to the extent that they install (as hereinbefore explained) such equipment or systems.

"According to available information, the aggregate annual sale of industry products is between four and five billion dollars.

Objectives of Rules

"Primary objectives of the rules are the maintenance of free and fair competition and the elimination and prevention of unfair methods of competition, unfair acts or practices, and other trade abuses. They are to be applied to such end and to the exclusion of any acts or practices which suppress competition or otherwise restrain trade.

"Proceedings for the establishment of rules were instituted pursuant to industry application. A general industry conference was held in Chicago on May 20, 1955, at which proposals for rules were submitted for the consideration of the Commission. Thereafter, a draft of proposed rules was published by the Commission and made available to all industry members and other interested or affected parties upon public notice whereby they were afforded opportunity to present their views, including such pertinent information, suggestions, amendments, or objections, as they desired to offer, and to be heard in the premises. Pursuant to such notice public hearings were held in Detroit, Michigan, on January 6, 1956, and in Washington, D.C., on January 20, 1956, and all matters presented at said meetings, or otherwise received in the proceeding, were duly considered.

"Thereafter, and upon full consideration of the entire matter, final action was taken by the Commission whereby it approved the Group I rules as hereinafter set forth.

Such rules become operative thirty (30) days from the date of promulgation.

These rules promulgated by the Commission are designed to foster and promote the maintenance of fair competitive conditions in the interest of protecting industry, trade, and the public. It is to this end, and to the exclusion of any act or practice which fixes or controls prices through combination or agreement, or which unreasonably restrains trade or suppresses competition, or otherwise unlawfully injures, destroys, or prevents competition, that the rules are to be applied.

Group I

The unfair trade practices embraced in the rules herein are considered to be unfair methods of competition, unfair or deceptive acts or practices, or other illegal practices, prohibited under laws administered by the Federal Trade Commission; and appropriate proceedings in the public interest will be taken by the Commission to prevent the use, by any person, partnership, corporation, or other organization subject to its jurisdiction, of such unlawful practices in commerce.

Applicability of the Rules

The rules have application to persons, firms, corporations, and organizations engaged in the sale *and installation* of:

(1) Mechanical refrigeration units or systems for commercial or industrial use; or

(2) Mechanical air-conditioning units or systems for commercial, industrial, or home use.

(*Note* 1: As above used, the word "installation" makes reference to services the performance of which requires engineering knowledge and skill. Thus, window air-conditioning units and mechanical refrigeration units which are of such size and type as to require but a "plug in" to an established electric power system are not to be considered as products to which these rules have application.

Note 2: As above used, the words "air-conditioning units or systems" make reference to units or systems which are either capable of lowering, or of both lowering and raising, the temperature of the air within an enclosure and simultaneously effecting a substantial degree of control of the humidity and circulation of the air in such enclosure. Units or systems which are designed to raise, but not lower, the temperature of air within an enclosure are not products to which these rules have application.

Note 3: The above is to be construed as definement of the nature of activities to which the rules have application and is not intended as definement of the kind of products which may be designated "air conditioners" or "refrigeration units or systems.")

Rule 1 — Deception (General).

In connection with the sale and installation of industry products, it is an unfair

trade practice to use, or cause or promote the use of, any trade promotional literature, advertising matter, mark, brand, label, or device, or any other type of oral or written representation, which has the capacity and tendency or effect of deceiving purchasers or prospective purchasers as to the construction, design, model, origin, manufacture, quality, absence of noise in operation, strength, durability, life expectancy, utility, cost of operation, or safety of such products, or of their capacity to cool or refrigerate, or in any other material respect; or to mislead purchasers or prospective purchasers with respect to the need for repair, maintenance, or replacement of parts of such products after their purchase and use, or with respect to any services offered concerning maintenance of the products.

Rule 2 — Guarantees, Warranties, etc.

In the sale, offering for sale, or installation of industry products, it is an unfair trade practice to use, or cause to be used, any guarantee or warranty which is false, misleading, deceptive, or unfair to the purchasing or consuming public, whether in respect to quality, construction, serviceability, or performance of any industry product.

(a) The foregoing inhibitions of this rule are to be considered as applicable with respect to any guarantee or warranty in which the terms and conditions relating to the obligation of the guarantor or warrantor are impractical of fulfillment.

(b) It is also an unfair trade practice to make or offer any guarantee or warranty respecting an industry product unless the nature and extent of the undertaking, and any and all material conditions and limitations applicable thereto, are clearly and conspicuously stated in immediate conjunction therewith, and unless the obligations of the guarantor or warrantor with respect to the guarantee or warranty are scrupulously fulfilled.

Rule 3 — Prohibited Discrimination[1]

I. *Prohibited Discriminatory Prices, or Rebates, Refunds, Discounts, Credits, Etc., Which Effect Unlawful Price Discrimination.* It is an unfair trade practice for any industry member engaged in commerce, in the course of such commerce, to grant or allow, secretly or openly, directly or indirectly, any rebate, refund, discount, credit, or other form of price differential, where such rebate, refund, discount, credit, or other form of price differential, effects a discrimination in price between different purchasers of goods of like grade and quality, where either or any of the purchases involved therein are in commerce, and where the effect thereof may be substantially to lessen competition or tend to create a monopoly in any line of commerce, or to injure, destroy, or prevent competition with any person who either grants or knowingly receives the benefit of such discrimination, or with the customers of either of them: *Provided, however*—

(a) That the goods involved in any such transaction are sold for use, consumption, or resale within any place under the jurisdiction of the United States;

(b) That nothing herein contained shall prevent differentials which make only due allowance for differences in the cost of manufacture, sale, or delivery resulting from the differing methods or quantities in which such commodities are to such purchasers sold or delivered;

(*Note:* This proviso shall not be construed as permitting an industry member to allow a price differential to a customer, whether in the form of a quantity price discount, rebate, or other form, through billing as a single order an aggregate of the amount of two or more orders of such customer on which the industry member makes separate deliveries, when the price differential allowed is not based on a net savings in cost of manufacture, sale, or delivery of the products to said customer resulting from the different method and quantity in which the products are sold and delivered to said customer, or is more than due allowance for such net savings; nor is this proviso to be construed as permitting an industry member to allow a price differential to a customer, whether in the form of a quantity price discount, rebate, or other form, when, pursuant to agreement or understanding by the industry member and the customer, delivery of the products purchased is to be delayed or made in installments so as to involve storage cost to the industry member, and when as a result of such cost or otherwise, the price differential allowed is not based on a net savings in cost of manufacture, sale, or delivery of the products to said customer resulting from the different method and quantity in which the products are sold and delivered to said customer, or is more than due allowance for such net savings.)

(c) That nothing herein contained shall prevent persons engaged in selling goods, wares, or merchandise in commerce from selecting their own customers in bona fide transactions and not in restraint of trade;

(d) That nothing herein contained shall prevent price changes from time to time where made in response to changing conditions affecting the market for or the marketability of the goods concerned, such as but not limited to obsolescence of seasonal goods, distress sales under court process, or sales in good faith in discontinuance of business in the goods concerned.

II. *Prohibited Brokerage and Commissions.* It is an unfair trade practice for any industry member engaged in commerce, in the course of such commerce, to pay or grant, or to receive or accept, anything of value as a commission, brokerage, or other compensation, or any allowance or discount in lieu thereof, except for services rendered in connection with the sale or purchase of goods, wares, or merchandise, either to the other party to such transaction or to an agent, representative, or other intermediary therein where such intermediary is acting in fact for or in behalf, or is subject to the direct or indirect control, of any party to such transaction other than the person by whom such compensation is so granted or paid.

III. *Prohibited Advertising or Promotional Allowances, Etc.* It is an unfair trade practice for any industry member engaged in commerce to pay or contract for the payment of advertising or promtional allowances or any other thing of value to or for the benefit of a customer of such member in the course of such commerce as compensation or in consideration for any services or facilities furnished by or through such customer in connection with the processing, handling, sale, or offering for sale of any products or commodities manufactured, sold, or offered for sale by such member, unless such payment or consideration is available on proportionally equal terms to all other customers competing in the distribution of such products or commodities.

IV. *Prohibited Discriminatory Services or Facilities.* It is an unfair trade practice for any industry member engaged in commerce to discriminate in favor of one purchaser against another purchaser or purchasers of a commodity bought for resale, with or without processing, by contracting to furnish or furnishing, or by contributing to the furnishing of, any services or facilities connected with the processing, handling, sale, or offering for sale of such commodity so purchased upon terms not accorded to all competing purchasers on proportionally equal terms.

V. *Inducing or Receiving an Illegal Discrimination in Price.* It is an unfair trade practice for any industry member engaged in commerce, in the course of such commerce, knowingly to induce or receive a discrimination in price which is prohibited by the foregoing provisions of this Rule 3.

VI. *Exemptions.* The inhibitions of this Rule 3 shall not apply to purchases of their supplies for their own use by schools, colleges, universities, public libraries, churches, hospitals, and charitable institutions not operated for profit.

(*Note*: In complaint proceedings charging discrimination in price or services or facilities furnished, and upon proof having been made of such discrimination, the burden of rebutting the prima facie case thus made by showing justification shall be upon the person charged; and unless justification shall be affirmatively shown, the Commission is authorized to issue an order terminating the discrimination: *Provided, however,* That nothing herein contained shall prevent a seller rebutting the prima facie case thus made by showing that his lower price or the furnishing of services or facilities to any purchaser or purchasers was made in good faith to meet an equally low price of a competitor, or the services or facilities furnished by a competitor. See Sec. 2-b, Clayton Act.)

[1]As used in Rule 3, the word "commerce" means "trade of commerce among the several States and with foreign nations, or between the District of Columbia or any Territory of the United States and any State, Territory, or foreign nation, or between any insular possessions or other places under the jurisdiction of the United States, or between any such possession or place and any State or Territory of the United States or the District of Columbia or any foreign nation, or within the District of Columbia or any Territory or any insular possession or other place under the jurisdiction of the United States."

Rule 4 — Substitution of Products

It is an unfair trade practice to make an unauthorized substitution of products, where such a substitution has the capacity and tendency or effect of misleading or deceiving the purchasing or consuming public, by —

(a) Shipping, delivering, or installing industry products which do not conform to samples submitted, to specifications upon which the sale is consummated, or to representations made prior to securing the order, without advising the purchaser of the substitution and obtaining his consent thereto prior to making shipment or delivery; or

(b) Falsely representing the reason for making a substitution.

Rule 5 — Misrepresenting Products As Conforming To Standard

In connection with the sale or offering for sale of industry products, it is an unfair trade practice to represent, through advertising or otherwise, that such products conform to any standards recognized in or applicable to the industry when such is not the fact.

(*Note*: Illustrative of the type of misrepresentation inhibited by this rule is the practice of an industry member advertising or otherwise claiming that a product has been approved by a governmental authority or private agency, or meets certain specifications or standards, when in fact the product has not been so approved or does not meet the certain specifications or standards.)

Rule 6 — Deceptive Prices

The publishing or circulating of false or misleading price quotations, price lists, or terms or conditions of sale, with the capacity and tendency or effect of misleading or deceiving purchasers or prospective purchasers, is an unfair trade practice.

It is also an unfair trade practice to make or publish, directly or indirectly, any false, misleading, or deceptive statements or representations, through advertising or otherwise, concerning installment sales contracts used or their terms and conditions, including down payments, interest, carrying charges, etc., or respecting any other matters relative to such contracts or their terms and conditions.

Rule 7 — Misrepresentation as to Character of Business

It is an unfair trade practice for any industry member, in the course of or in connection with the sale and installation of industry products, to represent, directly or indirectly, that he is an air-conditioning or refrigeration contractor when such is not the fact; or in any other manner to misrepresent the character, extent, or type of his business.

Rule 8 — Inducing Breach of Contract

Knowingly inducing or attempting to induce the breach of existing lawful contracts between competitors and their customers or their suppliers, or interfering with or obstructing the performance of any such contractual duties or services, under any circumstances having the capacity and tendency or effect of substantially injuring or lessening present or potential competition, is an unfair trade practice.

Nothing in this rule is intended to imply that it is improper to solicit the business of a customer of a competing industry member; nor is the rule to be construed as in anywise authorizing any agreement, understanding, or planned common course of action by two or more industry members not to solicit business from the customers of either of them from customers of any other industry member.

Rule 9 — Prohibited Sales Below Cost

The practice of selling products of the industry at a price less than the cost thereof to the seller, with the purpose or intent, and where the effect is, or where there is a reasonable probability that the effect will be, to substantially injure, suppress, or stifle competition or tend to create a monoply, is an unfair trade practice.

This rule is not to be construed as prohibiting all sales below cost, but only such selling below the seller's cost as is resorted to and pursued with the wrongful intent or purpose referred to and where the effect is, or where there is reasonable probability that the effect will be, to substantially injure, suppress, or stifle competition or to create a monoply. Among the situations in which the requisite purpose or intent would ordinarily be lacking are cases in which such sales were: (a) of seasonal goods near the conclusion of the season; (b) of perishable goods in respect to which deterioration is imminent; (c) of obsolescent goods; (d) made under judicial process; or (e) made in bona fide discontinuance of business in the goods concerned.

As used in the foregoing paragraphs of this rule, the term "cost" means the respective seller's cost and not an average cost in the industry whether such average cost be determined by an industry cost survey or some other method. It consists of the total outlay or expenditure by the seller in the acquisition, production, and distribution of the products involved, and comprises all elements of cost such as labor, material, depreciation, taxes (except taxes on net income and such other taxes as are not properly applicable to cost), and general overhead expenses, incurred by the seller in the acquisition, manufacture, processing, preparation for marketing, sale, delivery, and installation of the products. Not to be included are dividends or interest on borrowed or invested capital, or non-operating losses, such as fire losses and losses from the sale or exchange of capital assets. Operating cost should not be reduced by items of nonoperating income, such as income from investments, and gain on the sale of capital assets.

Nothing in this rule shall be construed as relieving an industry member from compliance with any of the requirements of the Robinson-Patman Act.

Rule 10 — Commercial Bribery

It is an unfair trade practice, directly or indirectly, to give, or offer to give, or permit to cause to be given, money or anything of value to agents, employees, or representatives of customers or prospective customers, or to agents, employees, or representatives of competitors' customers or prospective customers, without the knowledge of their employers or principals, as an inducement to influence their employers or principals to purchase or contract to purchase products sold and installed by such industry member or the maker of such gift or offer, or to influence such employers or principals to refrain from dealing in the products of competitors or from dealing or contracting to deal with competitors.

Rule 11 — Enticing Away Employees of Competitors

It is an unfair trade practice wilfully to entice away employees or sales representatives of competitors with the intent and effect of thereby unduly hampering or injuring competitors in their business and destroying or substantially lessening competition: *Provided*, That nothing in this rule shall be construed as prohibiting employees from seeking more favorable employment, or as prohibiting employers from hiring or offering employment to employees of competitors in good faith and not for the purpose of injuring, destroying, or preventing competition.

Rule 12 — Deception as to Used or Rebuilt Products

(a) It is an unfair trade practice to represent, directly or indirectly, that any industry product or part thereof is new, unused, or rebuilt, when such is not the fact.

(b) In the marketing of industry products which are second-hand or rebuilt, or which contain second-hand or rebuilt parts, it is an unfair trade practice to fail to make full and nondeceptive disclosure, by a conspicuous tag or label firmly attached to the products, and in all advertising and promotional literature relating thereto, of the fact —

(1) that such products are second-hand, rebuilt, or contain second-hand or rebuilt parts, as the case may be, when such products have the appearance of being new; or

(2) that the rebuilding of rebuilt products was done by other than the original manufacturer, when such is the case.

Rule 13 — Defamation of Competitors or False Disparagement of Their Products

The defamation of competitors by falsely imputing to them dishonorable conduct, inability to perform contracts, questionable credit standing, or by other false representations, or the false disparagement of competitors' products in any respect, or of their business methods, selling prices, values, credit terms, policies, or services, is an unfair trade practice.

Rule 14 — Exclusive Deals

It is an unfair trade practice to contract to sell or sell any industry product, or fix a price charged therefor, or discount from, or rebate upon, such price, on the condition, agreement, or understanding that the purchaser thereof shall not use or deal in the products of a competitor or

(Continued on page 50)

Today's Modern Hotel Guest Calls For a Maze of Public Services

A Behind the Scenes Look at How The Statler at Detroit Provides the Many Needs of Guests Including Comfort Air Conditioning

LEO C. GAGE

Unit air conditioners like the 13 window sets in this photo, will soon disappear from the Guest rooms of the Hotel Statler, Detroit. Central station chilled water piped to individual room units will replace the stop-gap measures of post war years.

HOTEL BUSINESS is a fascinating enterprise in the eyes of the practical engineer. He sees in the varied activities of this business, many functions dependent upon his efficient and competent job performance. Hotel Statler, Detroit, a

Peter "Hap" Svalya
Chief Engineer
Hotel Statler, Detroit

waking service, or eating and drinking facilities in the Guest Cafeteria, Cafe Rouge, night clubbing in the Hilton affiliate, is no exception. Delegates to the 47th NAPRE Convention, October 29 to November 2, will have another opportunity to confirm observation of this writer, in this respect, at the Motor City meeting.

Members will, at first hand, observe host Don M. Mumford, manager; Lloyd Stahlcup, sales manager; Ernest Denhofer, caterer, and the other department executives in their functions. They will see how Peter Svalya and the engineering department quietly back them up in their comfort, hospitality and pleasure providing efforts. Old timers will have moments of reminiscence with Wm. Eberlien, chief emeritus, Peter's mentor of a few years past.

At the Detroit Statler, the engineers' headquarters and home away from home during the NAPRE convention this fall, attendants are afforded from 938 guest rooms, a variety of single rooms with bath or shower. Every room has the essentials of a modern home, which includes radio and telephone (some include T.V.). An ice water tap, sterilized and cellophane wrapped drinking glasses, morning newspapers and other reading material are among many extra no-cost room comforts. Services to make the guest's stay pleasant, such as the room service continental breakfast in the room, Terrace Room and Lounge Bar, four-hour laundry and dry cleaning service, can be gratified by just picking up the telephone in the room and caling the information desk or the assistant manager.

As a momento of his stay at the Statler, a member or guest can buy items such as a Hilton Hotel deck of playing cards, candy and other souvenirs. Also the smartest jewelry, apparel, etc., are obtainable in one of the eight Shops in the Lobby.

Behind Hostelry Scenes

To meet the various needs of guests, over 800 employees are busy at some task during the 24-hour day, seven days a week. Some of the scenes back of the house the guest never sees are as follows: From 4:00 o'clock in the morning, when the fire-

Leo C. Gage is a refrigeration inspector with Detroit's Bureau of Safety. He is publicity and public relations chairman for Michigan Chapter No. 1 NAPRE, Detroit, which chapter is host to the association's 47th convention.

Fig. 1 — Around the Detroit Statler engine room: top left — Chief Emeritus Wm. Eberlein pauses during a day of consultation, with Tom Nagarian one of the Hotel's electricians. Center — former Chief Eberlein shows the boys he can handle that ice field as in earlier days. Right — A Carbondale 2-cylinder double-acting vertical "Freon-12" compressor gets the "once-over" from the former chief who installed it. This 175-ton unit serves public space and 67 rooms. Lower left — Inspecting the 4800 volt supply switchgear. Center — One of two 500 kva/240 DC rotary converters used for all 40-year old supply and exhaust fan motors, laundry washers, and Otis elevator supply. Right — Joe Englert, repairman, is over 25 years at the Statler, serving under Chief Eberlein and Chief Svalya.

man lights the kitchen ranges and ovens, to the closing time, 40 cooks will be preparing 800 lbs. of various cuts of fresh meat, 400 lbs. of fowl, 1000 lbs .of potatoes, 200 gallons of coffee, 600 lbs. of flour used to bake bread, rolls and various pastries. The 50 dishwashers, will have washed some 30,300 dishes and 24,900 pieces of silverware.

Process steam of 2,000,000 lbs. per month is used to heat the water for three kitchens, four Colt Autosan dishwashing machines, five glass washing machines, eight 10-gal. coffee urns, four 7000 gals. per hour hot water heaters (two of these heat guest's water), four steamers heating many dishwarmers, five 50 gals. or more soup kettles and the laundry equipment. In addition to the process steam consumption, an average of 5,000,000 lbs is supplied by Detroit Edison's central heating system to heat the premises each month during the heating season.

Laundry equipment is actually heated by steam supplied from a 2,000 lbs. per hour Sullivan steam booster compressor or the 2,900 lb. per hour Sullivan stand-by compressor. The Detroit Edison central steam is boosted from 35 lbs. to the 100 lbs. required in the laundry, by these units.

Gas for cooking and baking for a month will amount to 700,000 cu. ft. A billion gallons of water will have been used each month for the guests, hotel process and cooling equipment needs. During the month the laundry will have used 800,000 gals. of soft water. Approximately three tons of salt are needed to regenerate two large Permutit water softeners. Some 2,375 lbs. of soap will be used during the month, to wash 518,071 pieces of sheets and linens to maintain the high standard of clean linens.

An average of 120 tons of ice will be processed into cubes and shaved ice (see Fig. 1) to maintain freshness and quality in the culinary arts

Fig. 2—Room units installed by Chrysler's Airtemp Construction Corp. at the Detroit Statler. Left — Section of steel base removed to show foam rubber insulated copper tube run-outs from chill water supply and return in wall pipe chase. Right — Inspection panel and filters removed to show dual blowers and motor. Chilled water/warm water coil is encased above. A four-inch inlet in back of the blowers is adjustable for outdoor fresh air make-up.

and drinks during each month. Each year a greater demand has been placed upon the electrical system, by both the traveler, who uses more electrical appliances, and the hotel's desire to make the guest more comfortable, increasing wattage in lamps to brighten up rooms, installing television sets in rooms and air conditioning units, has pushed the monthly kva use to 500,000 units average at this writing and some $3,000 worth of lamp bulbs, fuses, lamp cords, etc. each month.

A staff of 40 employees in the engineering department maintain the various phases of electrical, plumbing, carpentering and mechanical maintenance in the hotel plus the painting of 300 guest rooms and service areas annually. Engineers, electricians, plumbers, plasterers, tile layers, elevator mechanics, painters, carpenters, repair men and T.V. repair men make up the crafts under the chief engineer's jurisdiction.

Refrigerating Applications

Existing refrigeration plant consists of two CO_2 50-ton capacity Wittenmier 5 x 5-in. reciprocating horizontal double acting machines, driven by a 100 hp direct connected Ideal syncronous motor. each. CO_2 cooled calcium chloride brine is circulated through a Bush fan coil unit in each of 50 refrigerators that range in size from a 15 x 15 ft. room to the reach-in type of box. The 130 can, 100 lbs. per can, ice making tank is also serviced by the latter two compressors.

The twenty 10-gal. ice cream can-holding tank, an 8 x 10 ft. walk-in freezer, a 10-gal. Emery Thompson ice cream maker, and sharp freeze reach-in box in the main kitchen are serviced by two 10-ton HDA Kroeschell CO_2 compressors. It takes approximately 15 tons of refrigeration to cool the two 12 in. diam. x 8 ft. Patterson-Kelly water coolers that serve each guest room with an ice water tap.

Existing air conditioning in the Terrace Room, Lounge Bar, Michigan Room, English Room, Wayne Room and five parlors are serviced by two CO_2 Wittenmier reciprocating HDA compressors, direct expansion type. One is a 100-ton 5 x 5 in. unit driven by an Ideal syncronous motor, direct connected. The other is a 50-ton unit driven by Vee-belts from a 50 hp. Republic repulsion induction motor.

Previous Installations

Air conditioning of the lobby, Cafe Rouge, barber shop, main ballroom and 67 guest rooms is serviced by a system installed in 1938 which uses a dichlorodifluoromethane 175-ton upright Carbondale (Worthington) 12 x 5 in. double-acting reciprocating compressor (see Fig. 1) direct-connected to an Ideal synchronous motor. The latter replaced a Westinghouse steam vacuum system installed in 1934. The indirect system chills water to 42 degrees, which is circulated by two pumps to the fan coil units in two fan housings and the 67 fan coil units in the guest rooms.

Expands Air Conditioning

The "growing pains" of air conditioning in public buildings is very interesting to the Statler's chief, Peter Svalya and his superiors. According to Svalya, what was acceptable in the early 1900's, such as the air washed systems in the air handling equipment line has gone out of style. The public demands better control of the air in their immediate surroundings for business and pleasure. Not only have changes in equipment come about, but hotel activity sales have influenced changes in the hotel equipment itself.

Recognizing these needs, the hotel has stepped up its program. In 1950, the Statler had 80 guest rooms and function rooms air conditioned. In 1954, 267 self-contained individual window units, in addition to 67 chilled water fan coil units, were installed in the guest rooms and function rooms. By June 1, 1956, Chrysler's Airtemp Construction Corporation will have installed in 697 rooms, 726 water chilled fan coil uints (see Fig. 2) and the remainder of the guest rooms will be air conditioned by the self-contained ¾ ton window units. Four 110-ton monochlorodifluoromethane Chrysler Airtemp radial compressor packaged water chiller

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ANHYDROUS AMMONIA

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- *Less than 50 ppm moisture*
- *Less than 10 ppm non-condensable gas*

A standard in the refrigeration industry for 75 years

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Kentucky — Louisville — Merchants Chemical Co. Inc.
Louisiana — New Orleans — Barada & Page, Inc.
New Orleans — Whitman-Holloway-Olivier
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Oklahoma — Oklahoma City — Barada & Page, Inc.
Tulsa — Barada & Page, Inc.
Tennessee — Memphis — Bessire & Co., Inc.
Nashville, — John Bouchard & Sons Co.
Texas — Austin — R. M. Hughes & Co.
Corpus Christi — Barada & Page, Inc.
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San Antonio — R. M. Hughes & Co.
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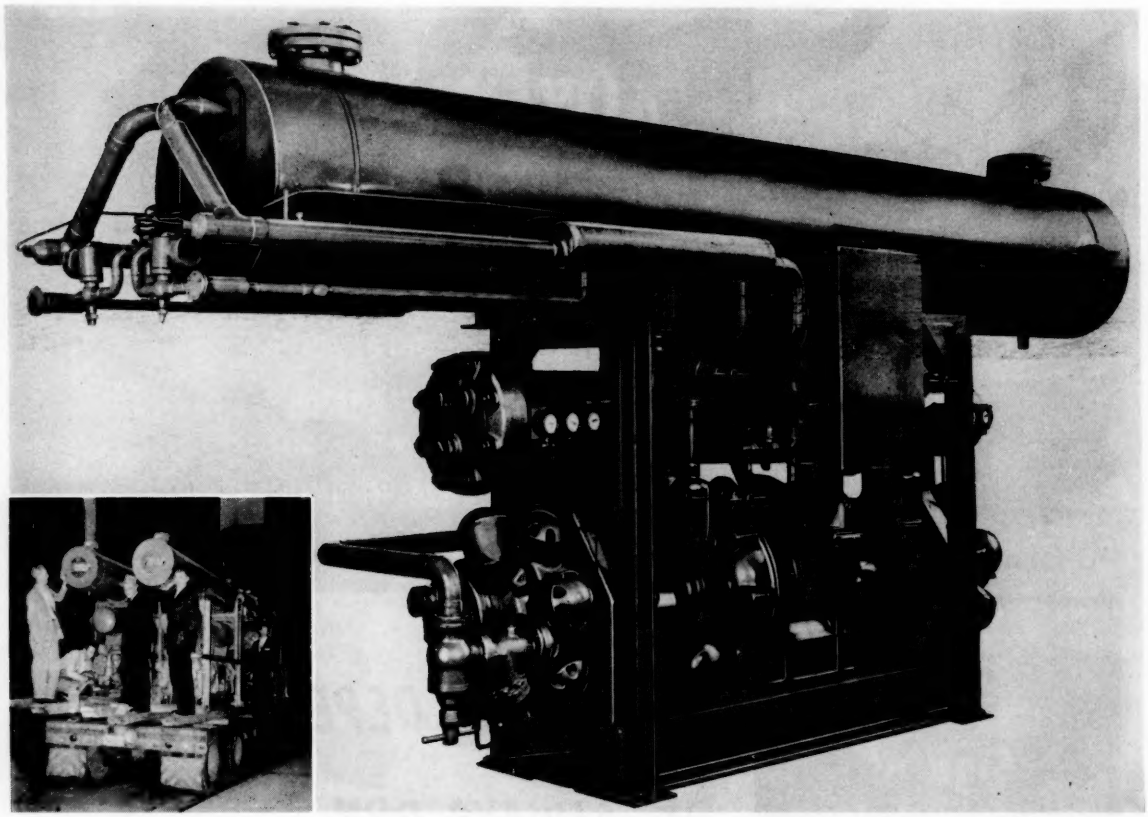

Fig. 3 — Typical of the four 110-ton chill water units being installed at the Detroit Hilton affiliate is this Chrysler Airtemp package unit. Compressors are two seven-cylinder radial type, driven in tandem from a 125 hp motor. Chiller is equipped with two monochlorodifluormethane coils, but coils and compressors have common suction. Insert — View of two units arriving at the Detroit Statler.

units and 550-ton Marley cooling tower will service the 726 fan coil units in the guest rooms.

Much planning had to be done to find space for the central cooling system and location of 28 pipe risers, using the reverse loop system and space for the cooling tower on the top of the Hotel. All had to be done without too great a loss of revenue. The machinery equipment room, etc., will occupy the space held by the engineer's storeroom, which is adjacent to the existing engine room. The moving of the engineer's storeroom forced the relocation of the trunkhold room, package room and general storeroom. Some space was taken from the wine room and housekeeping departments for the necessary 700 kva and 300 kva transformers.

Risers were silver soldered at the top floor, which is the house-maids' quarters and storage rooms. The pipes were lowered by steel cable through eight-inch holes drilled by a diamond boring tool through each floor, to the supply loop on the housekeeping floor. The riser chases and turnouts are enclosed by Met-L-Wood and formed metal baseboard respectively. Concrete was repoured around the risers at the floors to restore the fire stops and prevent flue action in chases. Each unit will have a four-inch fresh air intake also drilled through the masonry structure to the building exterior, for proper mixture with the recirculated air in the guest room.

While engineering this portion of the air-conditioning program, future needs were taken into consideration and the forward planning was done so as to provide sufficient electrical capacity, steel for cooling tower and sized pipe mains to care for the complete central station air-conditioning of the hotel guest rooms eventually.

Coordination of the steam-fitters, insulation installers, electricians, Met-L-Wood installers and unit installers is very essential to achieve a good schedule in an existing hotel, without disturbing the guest who lives next door. All of the latter was done and the room was turned back in order each night for the traveler's comfort.

Chiller Operation and Control

Two seven-cylinder tandem arranged Chrysler model W1422 radial compressors, driven by a 125 hp 440v/3hp/60 cycle A. O. Smith motor, service each of the Acme chillers (see Fig. 3). Although the chillers have two separately Alco thermovalve controlled coils, suction from the coils to the two machines is common. Both compressors discharge to a common condenser-receiver.

In operation, all compressors start unloaded, are up to speed in two seconds and loaded in six to eight seconds. Loading of the compressors is arranged to give 13 steps of capacity control from minimum to maximum loading. Each of the four units will start in automatic sequence as the demand requires. Changeover of lead-off unit is accomplished manually.

A specially designed Minneapolis-Honeywell control panel is the nerve

(Continued on page 50)

Practical Refrigerating Engineer

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS

Improving Refrigeration Systems By Applying Established Principles

J. E. WATKINS

RECENT "science-fiction" in consumer magazines and even the public press on developments in refrigerating equipment, permit professional and operating engineers to assume that the refrigerating industry is hopeful of uncovering basic or revolutionary principles. To say this industry scientists and engineers have made and propose to report on a comprehensive analysis of the field suggested by the subject would be quite a presumption.

Such matters as electronic or atomic refrigeration, for example, are best studied and developed in the laboratories of an RCA or a General Electric, where relatively unlimited facilities can be placed at the disposal of the researches. In fact, when occasionally an activity of this type which holds promise for the future of our industry is heard from, smaller industrial designers are happy to be reminded of the old saw: "Let George do it". This is not to say that small component and equipment firms are not interested in the basically novel approach; it is to say that there is enough room for development and improvement of the widely accepted compression refrigerating cycle to occupy their full and immediate attention.

It was with the idea that there existed in our industry a rapidly growing need for an approach to equipment design which would place the accent, not so much on competitive equipment sales but on economical operation and maintenance of systems and their components by the use of well established principles and data which it was felt, were being ignored, that the J. E. Watkins Co., was formed. It seemed, in fact, that the time had come for reappraisal — a reorientation — which new materials and methods were making possible elsewhere in our economy. This presentation is an attempt to describe briefly some of the improvements and developments which have been uncovered as a result of practical pursuit of this thinking.

Carry-over Elimination Aim

Fully or completely wetted interior surfaces of evaporative devices has generally been one of the more important aims of the refrigerating design engineer. To accomplish such performance meant refrigerant carry over risks and often substantially increased horsepower for pumping. Conventional pumping also invited vapor binding problems. Some manner of moving liquid refrigerant at a desired rate through evaporators was the goal, and with the least energy uses the ultimate aim.

Liquid Recirculation System

Rather than add pumps and increase power demands for such system improvement, why not develop a liquid recirculating system which would employ compressor discharge pressures to move liquid through evaporators? In many plants the compressors were required to operate continuously, which meant a ready source of gas pressure for such a system or development. The backbone of this line of development has been the so-called Automatic, Internal Liquid Recirculating System — now referred to, through usage, as the Recirculator.

Fig. 1 illustrates its insertion into the simple ammonia cycle. The resulting system allows for full flooding of the evaporators, the separation and recirculation of the excess liquid, and the removal of substantially saturated (certainly not *wet*) gas to the compressor. No mechanical pump is required. Rather, gas from the high-side effects the pumping action, and the resulting loss in volumetric efficiency of the compressor due to the reaxpansion of this gas is amply repaid in higher suction pressure and lower suction superheat. Oil is removed at the one location to which it is bound to be washed.

Serviceable Control Location

In the line of controls, the mechanism includes not over four solenoids and one check valve, all of which are located outside the refrigerated spaces where servicing is simplified. All of the solenoids are piloted by means of a transformer type secondary winding, which makes a transformer of the energized coil and induces a nominal 6 volts for lighting the coresponding pilot light. Trouble is thus easily detected and localized.

Flash Gas Economizer Uses

Carrying the idea of keeping evaporator interior surfaces as fully wetted as possible, but utilizing the economy of relatively lower and steadier pressures, the Flash Gas Economizer was developed. Fig. 2 pictures its use in a conventional NH_3 system with a Recirculator. Mounted in the liquid line between the receiver and the evaporators, this Economizer supplies liquid *in all seasons* at a steady reduced pressure to the evaporators as well as sufficient flash gas for Recirculator "pumping". There is no loss whatever in volumetric efficiency, with the excess flash gas removed to the compressor at the machine room.

This presentation is a modified version of talks given by the Author before NAPRE Chapters and Chicago Section, ASRE, in 1955. J. E. Watkins is President of his own firm located in Maywood, Ill. He is inventor of the Watkins' Recirculator and other components or systems mentioned in the article. He is a member of both ASRE and NAPRE.

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Fig. 1. (left) The Recirculator as used in an ammonia system, is shown on the draining cycle. When liquid rises to upper level in pumper drum, system is electrically changed over to the pumping cycle; valve Nos. 1, 2 and 3 are closed and valve No. 4 is opened. When lower level in pumper is reached, system reverts to drain again.

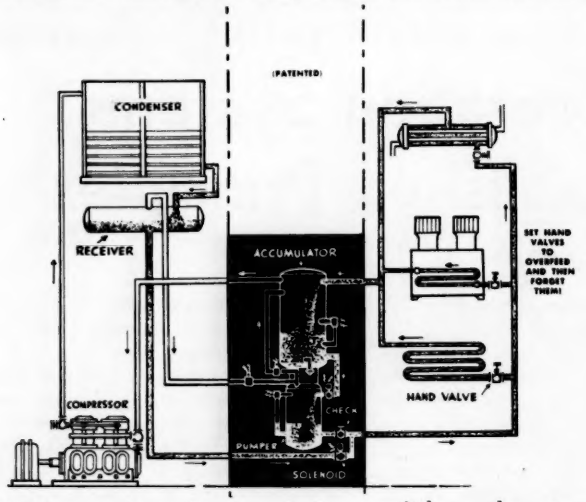
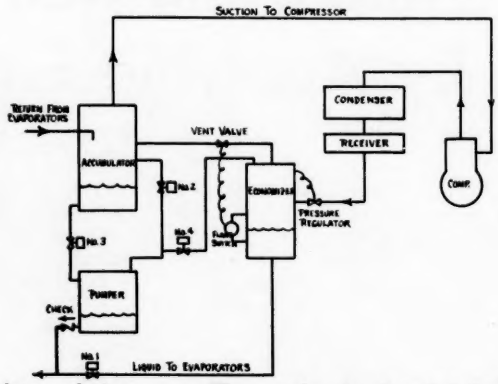


Fig. 2. (right) Flash Gas Economizer as used in a single stage ammonia system with a Recirculator.



With less gas returning through the suction line, this results in lower suction line pressure drops. The Economizer may also be used for supplying operating gas to a Recirculator which is far removed from the receiver.

At 185 psig condensing and 50 psig flash gas pressure, about 13 percent by weight of the ammonia evaporated in the plant is flashed off in the engine room (See Fig. 3). This results very noticeably in lower suction line pressure drops. Even at 65 psig condensing pressure the drop to 50 psig flash gas pressure, flashes two percent of the ammonia evaporated — more than enough to provide the gas needed for recirculation.

Recirculator System Use For Winter Condensing Pressures

Without the Flash Gas Economizer, with hand valves at all evaporators adjusted for slight overfeed at the lowest winter condensing pressure, the summer overfeed due to the higher condensing pressures prevailing then, will not overload the Recirculator. The unit is designed to handle easily twice as much liquid as the evaporators can boil off.

Weight of liquid discharged through hand valve orifices varies as the square root of the pressure drop. Ignoring static pressures, line drops and nozzle coefficients, a valve supplying just 100 percent of the liquid required to floor an evaporator at 75 psig condensing and 25 psig suction pressures will deliver theoretically only $\sqrt{3}$ or 1.73 times as much liquid when the condensing pressure rises to 175 psig. A heavy slug of liquid or a highly exaggerated overfeed will actuate a high-level switch on the accumulator, closing the main liquid supply valve and thus holding the liquid in the low-side to a limited amount until the Recirculator can clear itself.

Winter settings at the feed valves are recommended at the lowest winter pressures, which will bring on a "pumping" cycle perhaps once every fifteen minutes, with two to three minutes to empty the Pumper drum. This amounts to about 10 to 15 percent overfeed, which guarantees excellent average heat transfers at the evaporators.

Even in a conventional plant (without a Recirculator), the lack of fluctuation in liquid feed to float and thermal valve orifices argues for the addition of the Flash Gas Economizer. The supply of sub-cooled liquid to the coils provides better wetting of the cooling surface and consequently increases the heat transfer rate. Fig. 4 is a photograph of a 300-ton meat packing plant installation operating at 25-30 lbs. suction pressure and 50 lbs. flash gas pressure. The Pumper drum was buried in the floor because of limited head room. Fig. 5 is the preferred or standard vertical arrangement. The prewired control panel is furnished with each unit.

"Genetron", "Freon" Systems

Use of the Recirculator as a means of operating a multiple number of evaporators on one or two compressors (as is done conventionally with

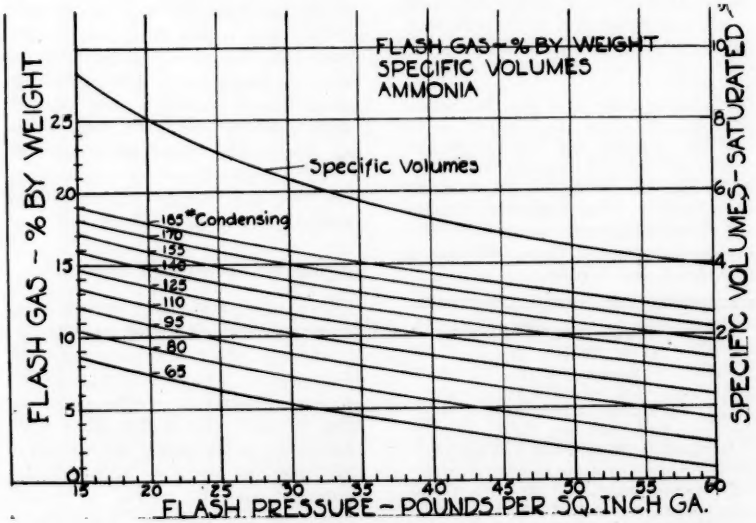


Fig. 3. Flash Gas—Percent by weight. Author shows how normal flash gas in system can be utilized and efficiency improved through its use with a Pressurizer and Recirculator in Conventional Compression systems.

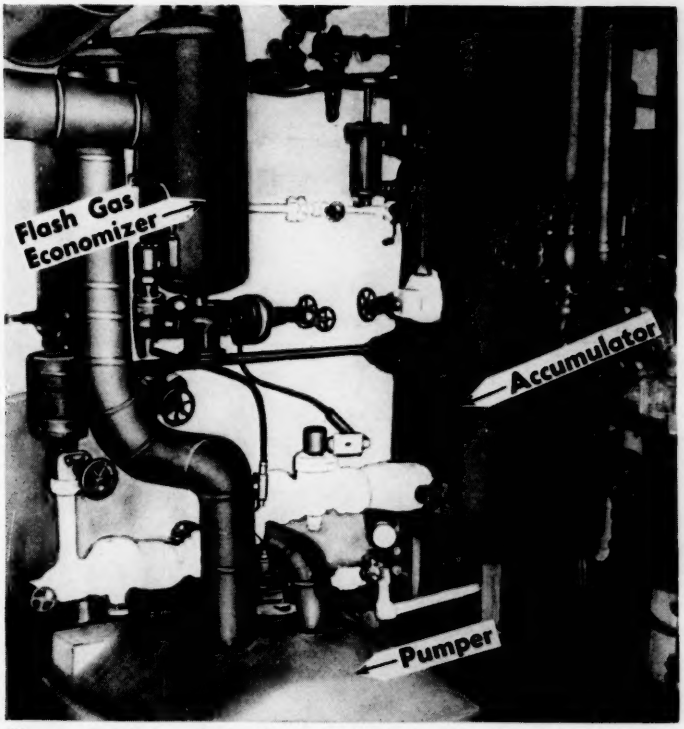


Fig. 4. A 300-ton Recirculator with Flash Gas Economizer installed in a meat packing plant. Pumper drum is located in floor due to inadequate head room.

ammonia) opens up a large field to the fluorinated hydrocarbon refrigerants. They, mainly because of the problems brought on by oil miscibility, have been generally restricted to systems having only one or two evaporators on one compressor.

Recirculator Application For Two-Stage Systems

Variations of the Recirculator application are many. One is shown in Fig. 6. A conventional two-stage system, with a liquid cooling coil in the Intercooler in the form of an intermediate pressure Recirculator, is equipped with another Recirculator in the Booster side of the system, operated by gas from the receiver. The Intercooler may be modified by removing the liquid cooling coil and flashing down to intermediate pressure all the liquid used in the low pressure part of the system. By this means, precooled liquid at the lower intermediate temperature becomes available, and flash gas at the intermediate pressure is used for operating the low pressure Recirculator.

Used in Two-Pressure Systems

Another variation is the two-pressure recirculating system, illustrated in Fig. 7. This arrangement fits into a plant which has two single-stage compressor arrangements with common high side. This is particularly desirable where the high pressure load is relatively small and intermittent. With this type of load, there would not be an uninterrupted supply of flash gas from the auxiliary accumulator to operate the low pressure Recirculator.

Safer Hot Gas Refrosting

Economic advantages and safety are readily apparent to the operator in the use of the Recirculator on freezer space. Hot gas defrosting becomes a very simple matter (See Fig. 8). Liquid slugs resulting from the defrost operation are returned through the suction line to the Recirculator and sent off to other coils for re-evaporation. No separate re-evaporators are required. Speed and

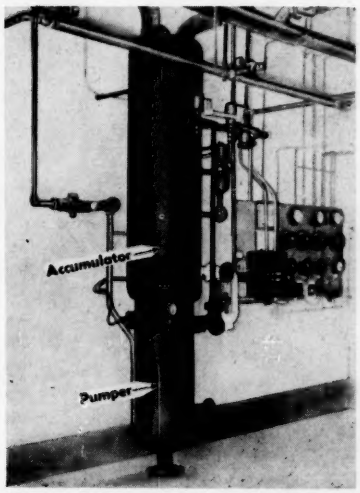


Fig. 5 Conventional installation of 110-ton vertical type Recirculator, showing prewired control panel.

simplicity with which the defrosting is accomplished eliminates necessity for the use of sprayed coils. Where only one coil bank or unit is tied to a Recirculator, the upper accumulator is made large enough to store the full coil charge plus the liquid condensed during defrosting. That liquid is then recirculated to and evaporated in the coil itself.

Liquid Chiller Improvements

It has long been recognized that spraying liquid refrigerant over the outside tubes carrying fluids at reasonably high velocities, gives the highest heat transfer rates (U) avail-

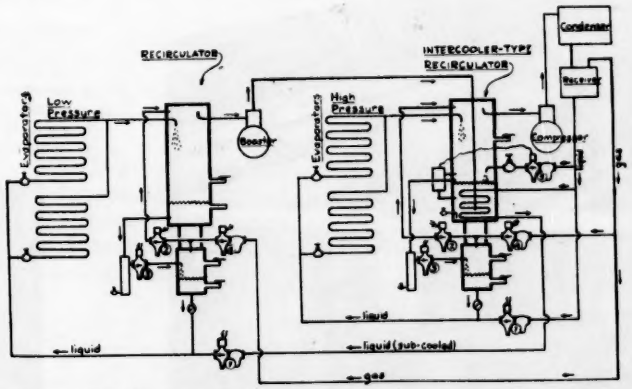
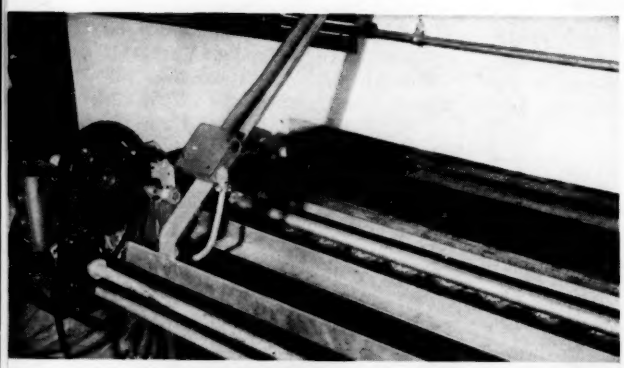


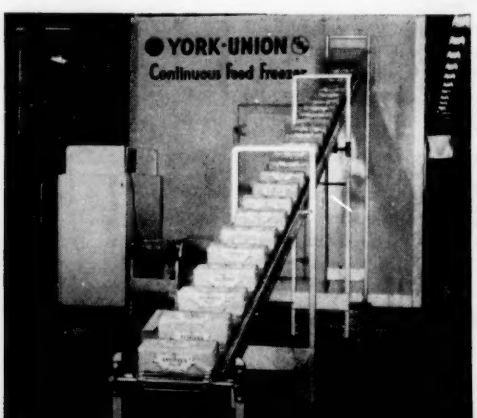
Fig. 6. Standard Recirculator and Intercooler-type Recirculator as used in a two-stage ammonia system.

THE BIG ADVANCE IN FOOD:



YORK CONTINUOUS PACKAGE FREEZER (left) automatically loads and unloads rectangular packages in volume. A single operator controls the entire freezing process. Automatic loader pushes each row of packages onto a freezing plate, where product begins freezing instantly on contact (upper left). Both top and bottom surfaces of packages are in intimate contact with plate and freezing is uninterrupted by loading of additional product. When filled, machine ejects row of frozen product for each new row of product loaded (lower left).

YORK-UNION CONTINUOUS FOOD FREEZER (below) handles varied products at high speeds, automatically. Amazingly versatile, this York-Union Continuous Food Freezer can freeze thousands of food packages an hour. A typical unit 60′ long, 14′ wide and 11′ high could freeze each of these quantities in an hour: 3720 half gallons of ice cream; 3560 loaves of bread; 2390 whole 2¼ pound chickens. A uniform temperature of −30° F. or lower can be maintained.



CONTINUOUS FREEZING BY YORK

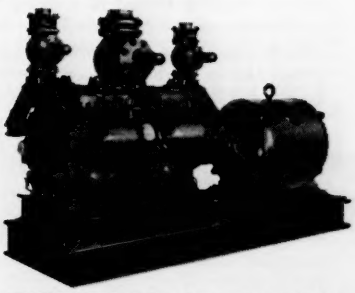
Two new versatile York freezing systems are completely automatic, make possible important economies in frozen food handling.

Automatic, high speed *continuous* food freezers are now a reality, thanks to York leadership in refrigerating equipment.

This is exciting news, not only for food processors, but for the housewife who buys food for her family. It can mean frozen foods in greater variety, at greater savings. Formerly, fresh foods had to be stacked on trucks by hand, pushed by hand into the freezer, and unloaded by hand. But York's new automated procedures will speed and simplify handling.

York designed one of these new freezers especially for large, bulky foods or odd-shaped packages. The other is for small, rectangular packages of uniform size, and can adapt itself to packages of different sizes as required by various runs.

For more information on these new freezers call your nearest York district office. The telephone number is listed in your Classified Directory under "Refrigeration Equipment".



HEART of any York freezing system is a York compressor. Above is a 3¾"x3" VW, one of many different types of York compressors.

York refrigeration air conditioning

the quality name in freezing

HEADQUARTERS FOR
MECHANICAL COOLING SINCE 1885

YORK
CORPORATION

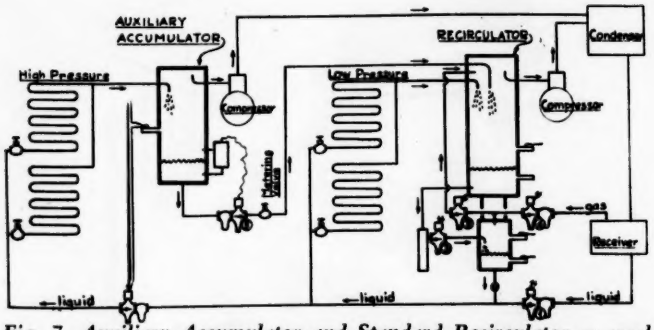


Fig. 7. Auxiliary Accumulator and Standard Recirculator as used in a two-pressure, single stage ammonia system.

able in shell and tube apparatus. Yet the industry, up to the present time, has ignored this type of heat exchanger in favor of the so-called flooded or dry expansion types of chiller, with accent on latter. This is true even though the spray principle is known to give as much as two to three times the heat transfer rates of the other types.

Recently, an engineer representative of one of the larger hydrocarbon refrigerant compressor manufacturers advised that for 14 years they had standardized on the dry expansion type because the flooded type led to difficulties in oil return. Their experience, and conclusion, appears to be typical. He might have added, had he been asked about spray chillers, that they did not use them for the same reason, plus the added problems introduced by the necessity to use mechanical pumps to recirculate the liquid. Pumps are not considered reliable which would account for the abandonment of spray chillers by the industry generally.

General acceptance, then, is a type of chiller in which the refrigerants are fed by a thermal valve through tubes — often finned to step up the performance — immersed in fluid which by means of baffles is channeled back and forth across the tubes, but of necessity at low velocities. Transfer rates of 90-100 in such units, between fluorinated hydrocarbon and water at 8-10 F MTD, are excellent. Contrast this with rates of 180-200 with calcium brine at 6-7 F MDT, obtained in spray chillers. The advantage of the latter becomes obvious.

By applying a small Pumper drum (Fig. 9) to a spray shell, excess liquid — and oil — is drained out of the chiller to a point from which the oil can be easily returned to the compressors, with the liquid recirculated as required by the spray design. In practice, it is found that very little overfeed is required to bring the "U" factor up to its peak, since flooding of all tubes is practically 100 percent as soon as a "pumping" cycle is reached. Excess oil cannot get away and is easily returned under pressure to the compressor suction or oil system during the pumpout side of the cycle. The positive oil return is provided for added insurance, since all of the oil appears to return in the suction gas provided that sufficiently high outlet gas velocities are maintained. However, present experience does not permit elimination of the oil return in view of the wide range of operating conditions to be encountered.

Fig. 9 and "Inset" show the preferred spray chiller arrangement for the so-called "safe" refrigerants. Often, several compressors will operate from one chiller, with capacity controls on all the machines. Therefore, it is desirable to charge the system with a critical refrigerant charge, up to the point at which the liquid rises into the telltale and actuates the switch shown. In this way, the receiver can be eliminated and liquid drained off from the condenser as rapidly as it accumulates, by means of the piloted liquid feed valve shown in Fig. 9.

In such an arrangement, the feed to the chiller is equal to the rate at which it is condensed, and the chiller is operated at all loads at top efficiency. Use of a hand valve to regulate this feed would be satisfactory but could call for an unnecessarily high rate of pumping at light loads. The main advantages of the arrangement shown are: no receiver, minimum charge, modulated feed, greatly reduced cooling surface, positive oil return, guarantee against liquid slugs to the compressors, and low suction superheats with resultant low discharge superheats. Consideration of space, in addition to high operating economy and low first cost, are thus taken into account.

A number of "Freon-22" and "Genetron-141" installations of this type are in operation. One of them rated at 120 tons on a calcium brine portable skating rink installation, operates with two compressors on the one chiller, delivering up to 180 Btu

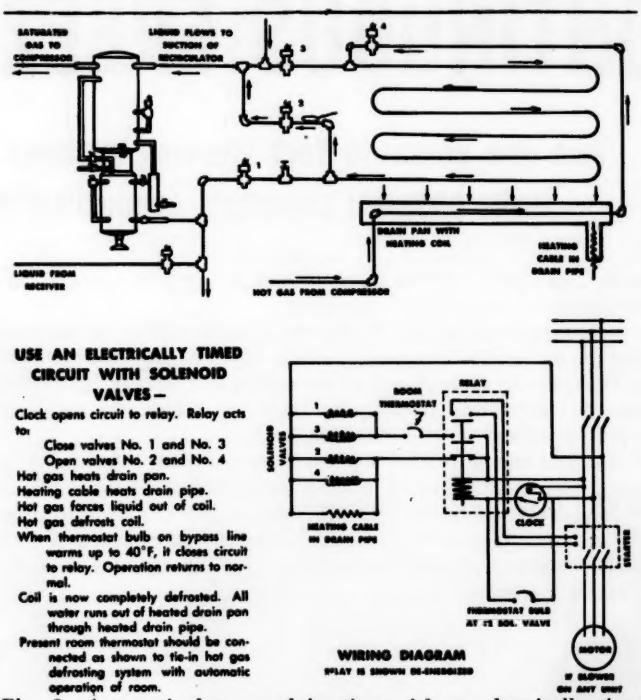
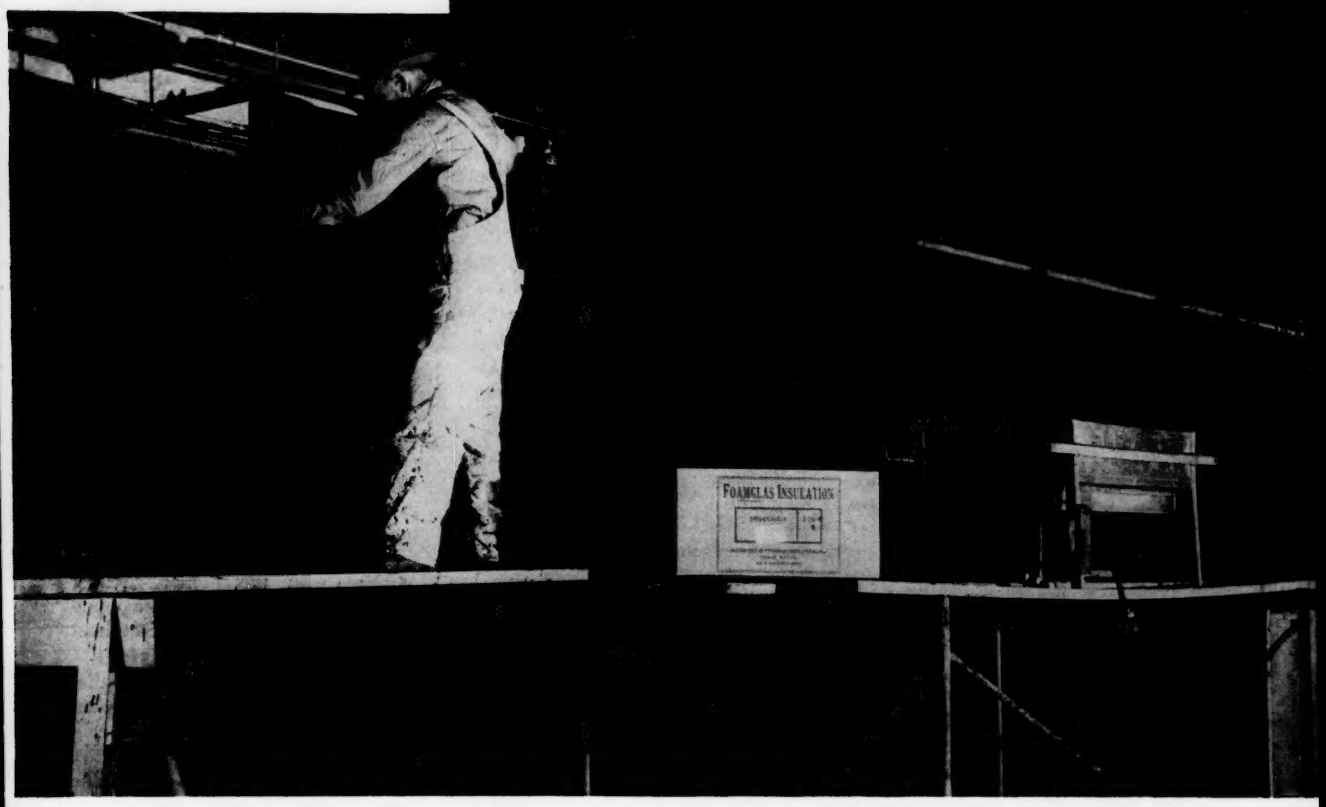

SATURATED GAS TO COMPRESSOR
LIQUID FLOWS TO SUCTION OF RECIRCULATOR
DRAIN PAN WITH HEATING COIL
HEATING CABLE IN DRAIN PIPE
LIQUID FROM RECEIVER
HOT GAS FROM COMPRESSOR
USE AN ELECTRICALLY TIMED CIRCUIT WITH SOLENOID VALVES —
Clock opens circuit to relay. Relay acts to:
Close valves No. 1 and No. 3
Open valves No. 2 and No. 4
Hot gas heats drain pan.
Heating cable heats drain pipe.
Hot gas forces liquid out of coil.
Hot gas defrosts coil.
When thermostat bulb on bypass line warms up to 40°F, it closes circuit to relay. Operation returns to normal.
Coil is now completely defrosted. All water runs out of heated drain pan through heated drain pipe.
Present room thermostat should be connected as shown to tie-in hot gas defrosting system with automatic operation of room.
ROOM THERMOSTAT
RELAY
SOLENOID VALVES
HEATING CABLE IN DRAIN PIPE
CLOCK
HEATER
MOTOR
WIRING DIAGRAM

Fig. 8. Automatic hot gas defrosting with an electrically timed Recirculator system.

FOAMGLAS®

the cellular, stay-dry insulation



In new —20°F. hardening room . . .

Carnation cuts construction costs with free-standing insulating wall of FOAMGLAS

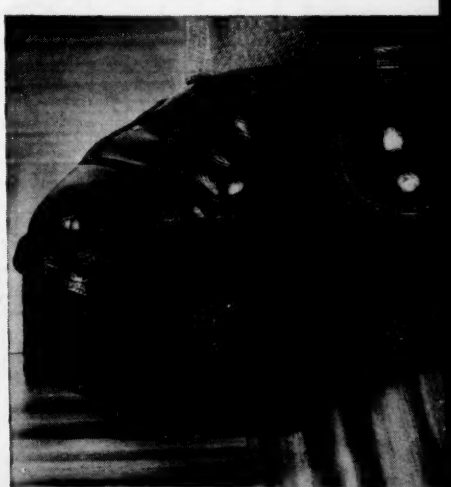
The Carnation Company, Oakland, California, built this free-standing insulating wall entirely of FOAMGLAS. The free-standing wall enabled them to cut construction costs for their new —20° F. ice cream hardening room. FOAMGLAS made this possible because its rigidity and unusual strength enabled it to function as *both* insulation and structural wall. Not even temporary supports were needed.

Carnation also used this unique cellular glass insulation for all other walls plus the floor and ceiling of the room. Its sealed glass cells mean FOAMGLAS stays dry, its insulating performance stays constant. That assures dependable temperature control and an end to the headaches and expense of insulation replacement. What's more, heavy loads can't hurt the extra-strong floor insulation.

You, too, will find this unique, *stay-dry* insulation the perfect answer for refrigerated spaces, piping and equipment. Completely inorganic, FOAMGLAS can't warp, shrink or swell . . . is vermin-proof and fireproof as well. Write us today for a free sample and up-to-date literature covering your specific needs.

Pittsburgh Corning Corporation
Dept. T-66, One Gateway Center
Pittsburgh 22, Pennsylvania
In Canada: 57 Bloor St. W., Toronto, Ontario

With this simple test you can quickly demonstrate for yourself the remarkable compressive strength of FOAMGLAS (over 7 tons per square foot). Write now for a free sample and complete directions for this and five other simple tests . . . easily performed right in your own office.



Pittsburgh Corning also manufactures PC Glass Blocks

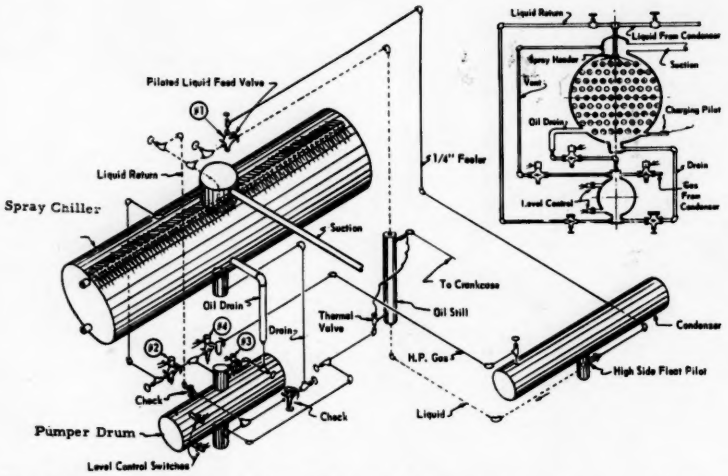


Fig. 9. Diagram of Spray Chiller-Recirculator as used in a fluorinated hydrocarbon refrigerant system (condenser is not included as part of unit). Inset: Sectional diagram of Spray Chiller-Recirculator showing tubes carrying liquid being chilled.

per sq. ft. per degree log MTD. The chiller has 1030 sq. ft. of surface and is 24-in. x 14 ft. The tubes are ¾-in OD prime surface, steel.

Weather Affects Condensing

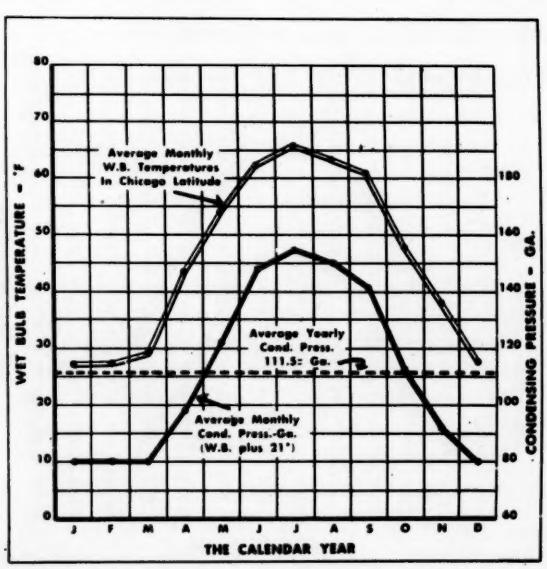
Many refrigerating systems must be operated in the winter in such a manner that the condensing pressure is held high enough to feed the required amount of liquid through control valve orifices. The use of a Recirculator and a Flash Gas Economizer on a conventional plant will allow for steady, low pressure liquid feed to thermals and floats, providing the advantages of relatively steady pressure drops with possible low condensing pressures. Therefore, artificial head pressures need not be maintained. This is a simple inexpensive way to effect very noticeable operating economies. But its limitations are obvious.

Average monthly evaporative condensing pressures during the year in the Chicago latitude in accordance with the average Wet Bulb temperatures are shown in Fig. 10. Resulting condensing pressures are based on the fact that evaporative condensers are generally purchased to deliver their ratings at 96 F condensing temperature (185 psig) and 75 F WB, a difference of 21 F. This is for ammonia; higher condensing temperatures are usually figured for the fluorinated hydrocarbons.

In July, having an average wet bulb temperature of 65.5 F (See Fig. 10) an average of 86.5 F condensing temperature, or 155 psig could be expected. The other months follow in the order shown, except for January, February, March and December. Because of the freezing wet bulbs prevailing during these months, for charting purposes all wet bulbs which will result in freezing the spray water were elevated, thus imposing revised figures for these months. Started from a very safe 32 F WB, adding 21 F and arriving at 53 F condensing temperature (or 80 psig condensing pressure) for all winter months, the annual average thus comes to 111.5 psig.

Procedure during the cold months, in many places it to cut down on sprays, cut out blowers, or shut down entire condensers in order to hold condensing pressures which will feed valve orifices to avoid "starving" the evaporators. Usually this means maintaining 140 to 150 psig during the cold periods. Averaging this practice with the higher summer pressures results in an average annual condensing pressure of at least 165 psig.

It will be seen from Fig. 11 that a compressor operating at the usual 165 psig condensing and 25 psig suction pressures will require 1.31 Bhp per ton of refrigeration. At the same suction pressure and a controlled 111.5 psig condensing pressure, the compressor will require


WET BULB TEMPERATURE - °F
CONDENSING PRESSURE - GA.
Average Monthly W.B. Temperatures In Chicago Latitude
Average Yearly Cond. Press. 111.5: Ga.
Average Monthly Cond. Press.-Ga. (W.B. plus 21°)
J F M A M J J A S O N D
THE CALENDAR YEAR

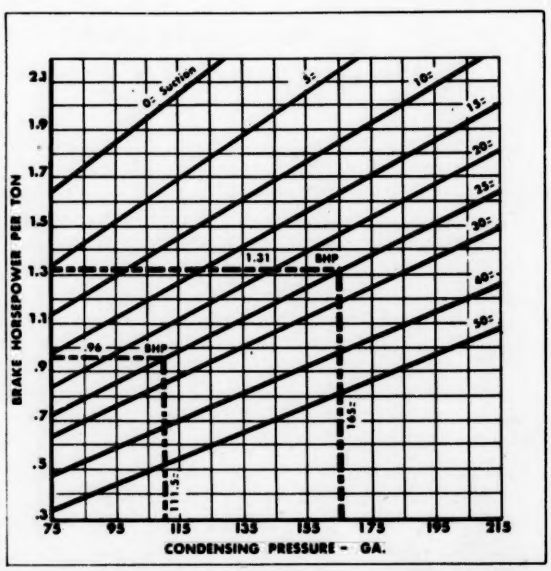


Fig. 10 (left) Relationship of Available Condensing Pressures to wet bulb temperatures during year. Fig. 11 (right) Relationship of condensing pressure to brake horsepower (based on using 8 x 8 in. VSA compressor at 400 rpm).

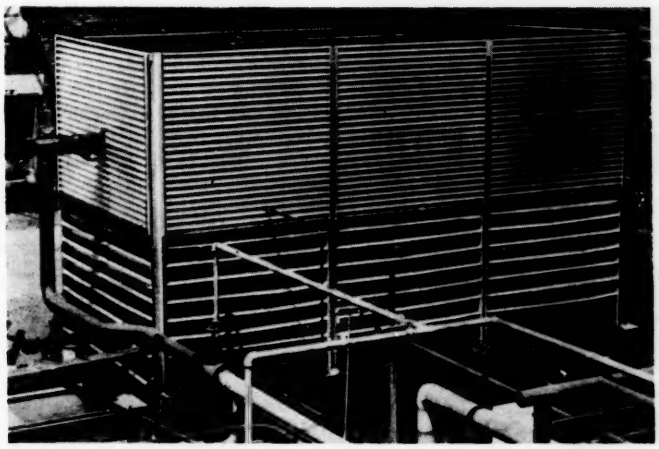


Fig. 12. A 100-ton Atmospheric Spray Evaporative Condenser.

only 0.96 Bhp per ton, an annual saving of 26 percent. Looking at it in another way, a plant which is not controlled in the manner described is consuming about 40 percent more power than necessary.

Adds Water Sprays To Evaporative Condensers

An atmospheric spray evaporative condenser (See Fig. 12) provides "winterizing" facilities for arriving at the economies outlined. Other manufacturers offer comparable facilities, although the usual procedure is to set the controls to hold the condensing pressure up to some point higher than the weather would like to furnish over much of the year. The Recirculator would prefer that such controls be reversed in their function so that the condensing pressure will be held to the minimum possible at all times.

The Atmospheric Spray Condenser adopts another old idea and brings it up to date. It consists of a pan and louvered casing enclosing a prime surface coil assembly overwhich is mounted a bank of sprays supplied from a pump mounted under the pan. By enclosing the pump area and applying heat in freezing weather, or mounting the pump inside the building and installing a sump tank, no moving parts are presented either to the sprays or to the weather. All parts are immediately accessible and danger of freeze-up is eliminated. Fig. 12 shows a 100-ton ASC for an ammonia plant.

Since only a pump of moderate size at a low head is required for the condenser's performance power input to the condenser is much less than is called for by the usual forced draft type evaporative condenser. A standard ASC condenser rated at 300 tons at 75 F WB and 96 F condensing temperature will require only 15 connected horsepower for pumps. Motors totalling as much as 40 hp for fans are usual in these tonnages.

A water-spray-cooled oil separator between a sprayed desuperheating coil and the main coil, with positive liquid drain provided at all passes, is incorporated.

Suggests Liquid Pressurizer

There are many plants of all sizes where the speediest and most obvious first step towards economical operation could be the retention of existing thermal and float valves. Perhaps the cost of changeover to larger float and thermal valves might be excessive. Imposition of a relatively high condensing pressure would guarantee their feeding the required amount of liquid and perhaps to make the best of undersized or outgrown liquid lines. For such applications a Liquid Pressurizer would be advisable.

There is no economy in operating

(Continued on page 56)

News Notes and Chapter Activities

Pittsburgh — Another installation and another Chapter laid claim to the Biggest on April 26 when members of Pittsburgh Chapter toured the 4500 ton central station plant for that City's three Gateway Center office buildings. Local newspapers, equipment vendors, and building engineers claim this plant to be the largest commercial air conditioning plant in the world. NAPRE members here know that it is big, but didn't venture a bet on its being the biggest with more of these giant stations coming into use every day. Members would classify the installation as Industrial rather than commercial.

Chief Engineer, Joe McCorkle personnally supervised the Pittsburgh Chapter visit. He proudly introduced his assistants, most of whom were on hand. There are two operating engineers (inside the plant) and four air conditioning engineers (outside), who keep the three centrifugal machines and the networks of chilled water piping and air distribution apparatus in operation. The plant operates daily from 7:00 am to 8:00 pm, and from 8:00 am to 5:00 pm on Saturdays and Sundays.

Plant Statistics

According to Gateway's chief engineer, the system circulates 450,000 gpm of chilled water. Over 750,000 cfm of heated or cooled air is moved through high and low velocity duct work to 6,000 individually controlled room units. There is an estimated 7,000 persons employed in the conditioned areas on some 64 floors (total) of three buildings. Individual room units receive low velocity air for fresh air and space loss make-up. Each unit is equipped with chilled water coils for tempering recirculated air and for humidity control.

Pittsburgh members thought they heard the Chief wrong when they learned that the water for the system is received from the Allegheny River. but the local newspapers backed up that statement in publicity articles a few days later. Condensing water is also from the Allegheny River. Condensing and chilled water piping is estimated at 72 miles in length.

The air circulated through the ventilating system is distributed through 24 sets of electro-static filters. Fan sets also number 24, the largest fan being 8 and ½ feet in diameter.

At the time of the chapter visit, the plant was being changed over from warm air, warm water operation to chilled water and refrigerated air operation. Chief McCorkle explained that they lower the temperature of the system gradually by use of manual controls when changing over from winter to summer operation. After the water temperature has been lowered the plant is set on pneumatic controls, operates automatically from that time on. Temperatures are lowered gradually to avoid rapid contraction of the piping which could distort portions of the system and possibly cause minor damage.

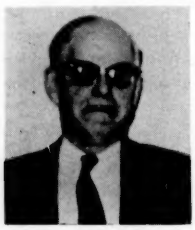
McCorkle is a colorful host and by means of comparisons described to the members what his plant could do. For example, with regard to the amount of water circulated he said "That's enough water every hour to provide one person with a bath every day for 82 years". "Frying an egg on the sidewalk is rank amateurism in comparison to what this giant system can do". According to McCorkle, "on a hot day any summer, this machinery, operating at full capacity, extracts enough heat from the three Gateway Buildings to cook three million 16-ounce steaks. Or to put it another way, it would be enough to heat an ordinary three-bedroom house through about 15 years of brisk

(Continued on page 40)

From the President's Desk

Convention Nominating Committee Appointed
Paulick Instigates Membership Feud

THE Detroit Convention arrangements are shaping up fast according to reports received from Director Roy T. Burns. Hotel accommodations have been arranged. The ladies and social programs have been mapped out. The National Educational Committee met in April to complete details on the speaker's program. The Chapter at Detroit has shouldered their responsibility well under the leadership of Charles M. Heemstra. Members should plan to be in Detroit October 29th through November 2nd.



Roy T. Burns

Gubser Heads Nominating Unit

That time of year has arrived when it is necessary for the President to make known the names of the Nominating Committee who will recommend a slate of candidates for the 1957 officers of the NAPRE. Committeemen are as follows: Jr. Past President Regis Gubser — Chairman, Past Presidents Leo J. Vivien, Alvis Clay, Howard Peterson, and Ken Holaday. Alternates are Ward Stoner of Milwaukee, B. E. Smith of Fairmont, Minnesota (a Member-at-Large), and Charles W. Moneypenny of Miami Beach, Fla.

In the interest of the NAPRE as a whole, may I suggest that the Chapters send their ideas and suggestions regarding National Officer material to these committee members at an early date, as well as instructing their delegates to voice their views from the floor after nominations are made.

A By-Laws Committee is in the process of being formed and will report about 60 days before convention time. The purpose of the committee is not to revise our by-laws again, but to clear up some contentions that were voted on from the floor without having been discussed in individual Chapters, and the delegates were not instructed how to vote.

Quinn Challenges Cox to Century Club Leadership

Two prominent members of NAPRE were recently involved in a challenge which they hope will be inspirational to membership committees throughout the Association. Membership Chairman George Paulick had overhead some remarks of Association Member-at-Large, Allan W. Cox, to the effect that he thought it would be relatively easy to bring in 100 new members for NAPRE. When this rumor got around, Past National President, Emmett T. Quinn, with his characteristic mutterings and rumblings under his breath, indicated to Paulick that no red-blooded active member of NAPRE should allow an Associate member to get ahead of him in any department as vital as membership.

Chas. M. Heemstra

First Century Club Membership Meeting of NAPRE: Allan W. Cox, Toledo, Ohio, (left), challenges Emmett T. Quinn, Los Angeles (right), to leadership of a new club started recently. George Paulick, National Membership Chairman, sees to it that no rabbit punches are thrown.

At the April TRRF-NARW meeting at the Los Angeles Statler Hotel, Paulick succeeded in bringing the two together. It was hard for Paulick to determine who was the challenger and who was the champ, but it was definitely decided that the first to sign up 100 members would be undisputed President of the so-called Century Club.

Quinn and Cox further challenged other members to try to unseat them from their titles in the Century Club.

Detroit Challenges Denver to Dairy Industry Leadership

Official correspondence from Michigan Chapter No. 1 challenges a statement by Denver in the April issue as to their claim that they had signed up the first members in the 1956 Dairy Industry drive. Detroit welcomes other chapters to take a look at their records and see how they stack up against this:

Thirteen new Dairy Industry members signed up at Detroit since October 1st, 1955.

Twenty members of the Dairy Industry received in the chapter prior to the start of this Milk Industry campaign.

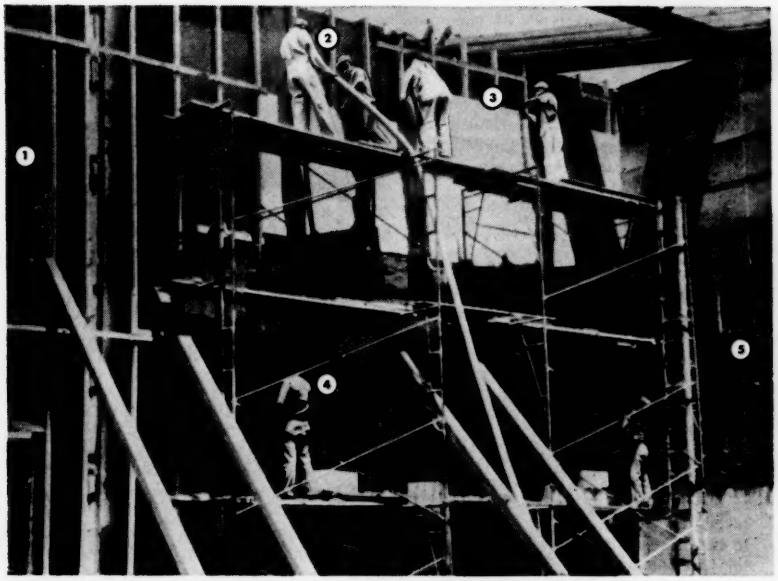
Report Honors to Pittsburgh

Pittsburgh Chapter's report of the month, according to the National President, Publicity Chairman and National Secretary, receives honors for the fine account of a field trip to central station air conditioning plant of the three Gateway Center Buildings' 4500-ton facility. The report is contained in this issue of our official organ. Selection of an honor chapter was difficult this month, as there were several outstanding reports. Chapters are encouraged to continue reporting on this material. All members benefit from reports containing facts and descriptive data of this nature.

L. Etzel

PALCO WOOL®

THE VOID-FREE INSULATION



Job photo shows five construction steps: 1—Vapor barrier on warm side of wall. 2—*Palco Wool* being applied by void-free method (described fully in new Refrigeration Insulation Manual). 3—Temporary retainer for next course of *Palco Wool* being nailed to studs. 4—Insulation being inspected for void-free fill in wall area exposed by removal of temporary retainer. 5—Self-supporting *Palco Wool* in place. Note how temporary retainer has been removed from all but top area, while interior finish is being placed at bottom of 27 ft. wall.

NO POCKETS—NO VOIDS

Entire wall is insulated before interior finish is applied. Self-supporting *Palco Wool* is then inspected to eliminate any possibility of pockets or voids.

NO JOINTS

Palco Wool forms a continuous insulating barrier. As a uniform unbroken mass, it fills every nook and cranny—hugs every surface. With *Palco Wool*, there are no problems of heat leaks due to improper fitting at edges and around structural members.

NO SETTLEMENT

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(Continued from page 37)

Pittsburgh winters." In describing the air moved through the three building systems, McCorkle said the ¾ million cubic feet was equal to 180 box car loads every minute.—O. P. KNOCH.

Louisiana Tours J-M Plant Studies Compressors, Drives

New Orleans — Refrigerating compressors in the Frozen Food Industry was the topic handled by Educational Instructor, Tom Stokes, on February 17, Through more than just coincidence there were on hand a number of printed articles on this subject by Freezer Equipment Sales Company, York, Pa. An added feature of the evening's program was a 30-minute color movie, "The Eager Minds". This film depicts recent developments in the Electric Industry and dabbled in forecasting living in the future with atomic power, solar batteries, transistors, etc.

On March 14, Louisiana's No. 2 Chapter had a get-together party at Crescent City Ice Auditorium. Something "for the inner man" at this party consisted of Creole shrimp stew and rice with a good salad and plenty of refreshments. Brother Jerry Vieages, Chairman of the Entertainment Committee and his boss, George Gabler of Gabler Insulations, arranged this entire affair at their expense. The work put in by Jerry, George, Al Ballanco, Benny Triche and others were greatly appreciated by the chapter.

Brother Leo Vivien was in Tampa and missed the party. Although he installed the Charter for the new Chapter there he was greatly missed. However, New Orleans loss was Tampa's gain (?), and this chapter knows for certain he had a swell time while he was there. His wife, Beulah, enjoyed the trip also.

On March 28, the chapter made a visit to the Johns-Manville Company Plant at Marrero, Louisiana. Through the untiring efforts of Educational Chairman, Marion Olivier, this visit was accomplished and a success. Ralph M. King, Industrial Relations Manager of this Johns-Manville plant was instrumental in having guides with each group throughout the plant. It was a well planned and conducted tour. Refreshments and donuts were served afterwards in the Company cafeteria.

Jerry Vieages, entertainment chairman, stirs one batch of shrimps Creole while he shares a laugh with Frank Chase and John Mariakis, national vice-president and director respectively. (Editors note: Someone is sure to question how the two national figures consumed the beverage with the closures on the bottles. Another member came to their aid moments after the shutter clicked.)

On April 11, 1956 the regular meeting was held in the Roosevelt Hotel and Chapter 12 of the Guy King Course on "Compressor Drives" was the main topic. It was a very interesting meeting and well attended. In addition, a sound and color film titled "Movable Walls" was obtained through the courtesy of the Johns-Manville Co. G. C. Carr of that company conducted a running commentary and answered all questions on this subject.

On April 25, Educational Chairman Olivier again presented Tom Stokes, Instructor, to discuss Chapter 14, "Operating". It was one of the best sessions had in quite some time. Many engineers have problems on various types of operations. So, as expected, the professor was manhandled with a lot of questions (and he answered all of them). The Chapter is still working hard on delinquent members and Membership Chairman Dumaine has a lot of ideas that will go into effect shortly to bring in new members. — JOHN MARIAKIS.

Telephone Plant Conditioning Chicago Meeting Topic

Chicago — Illinois Bell Telephone Co.'s Morton Building, 20th floor cafeteria was the setting for Chicago Chapter's April 24 meeting. Instructor Dick Zach conducted a unique quiz-type preliminary session, followed by Ernest Bueter on air conditioning applications for communications plants, and ending with an inspection of the new steam plant in this building.

Zach's quiz was in the form of a sheet of paper with eight questions on it, given to all the members. These questions were to be answered in a given time, and after the time was up, Dick then explained each question and worked out the problems on a blackboard. There was a general discussion of the questions as Dick explained them. All the questions pertained to compressors, as this is the chapter being studied at the present time. Another sheet was given members by Dick with seven questions similar to those on the first sheet. Instructions were to answer the questions and have them ready for the next meeting.

President Nick Downes then introduced Ernest Beuter, Consulting Engineer for the firm of Holabird, Root, and Burgee. His talk, "Air Conditioning of Telephone Buildings" involved all the aspects of conditioning of the air, including filtering as well as temperature and humidity control. Speaker Beuter explained the difference between the old time and present day air conditioning systems. He had a chart which showed the three types of conditions that have to be designed for; peak summer heats, fall and spring dehumidity control, and winter heating and humidification. This chart also had temperatures for each condition and a section which prescribed the use of refrigeration, heating or humidification. Engineer Beuter also explained the many architectural, mechanical (relative to exchange equipment) and human problems that have to be coped with in order to design such an air conditioning system. After the talk, Beuter answered all the questions the members had for him.

Brother member, Earl McMicheal, also with Illinois Bell, gave a short preview of what was to be seen on the tour of the new Central Heating Plant. McMicheal explained that the two boilers in this plant supply heat for seven other telephone buildings. Particular attention was directed to the fact that this plant is among the first to have the piping painted or labeled to comply with ASA. NAPRE tourists saw the usual modern steam plant and auxiliaries including fuel pumps and preheaters, (the pump will deliver 200 F fuel oil to the burners).

Each boiler is equipped with two steam atomizing oil burners of the Y-jet type, with modulation control and provision for manual or automatic operation. The boiler feed water heater separates entrained air from the water and delivers 225 F water to the boilers. There are two boiler feed pumps which are turbine driven and a third which is motor driven. Each pump has a capacity of 95 gallons per minute. There are two oil tanks with 20,000 gals. capacity each. Other auxiliaries included combustion and safety controls, vacuum and condensate return pumps. The plant also has a water treatment system which consists of softener, chemical treatment and gravel filters.

Compressor Calculations

At the April 10 meeting, Dick Zach was the instructor for the educational class. He first reviewed the refrigeration cycle with the members and then continued with the second part of Chapter 20, "Compressor Calculations". One of the members had worked out a problem from this chapter, so Dick and the member worked the problem out step by step on the blackboard for the rest of the members to see. They used the various formulas and did the calculations which were necessary.

John Forti, program chairman, then introduced Mr. Genz from Garlock Packing Co., who gave a talk on "Packing and Mechanical Seals". Slides were shown to illustrate his talk. Genz explained the different types of mechanical seals and their functions. He told of some advantages they may offer, such as quick and easy installation, built in safety features, maintenance free life, reduction on parts inventory, a one piece assembly pre-set at the factory, and a circulating connection in the glands to provide cool, clean lubrication. He explained the different materials used in the construction of the seals, told of the recommended liquids used, the pressures, temperatures and shaft speeds. He also related that non-standard materials may be substituted in the seals wherever the condition warrants it.

Chicago chapter is taking Chapter 20 "Compressor Calculations" in parts because it is long and complicated and Dick Zach, York, Corp., the instructor feels members therefore may do a better job on the formulas and calculations. This chapter merits a little extra time and effort. Dick explained the "Freon-12" saturated

Take a tip from those who know refrigeration best!

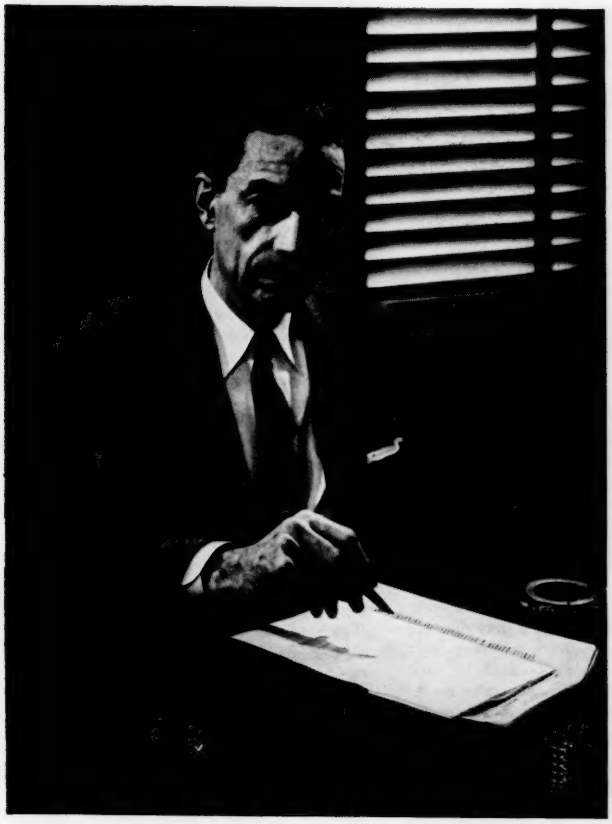

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table. He explained just what each column in the table meant, what Enthalpies were (they are the heat of the liquid, latent heat, and total heat of the vapor). He also related what Entropy was (it is a useful relationship between heat and temperature and for most work; the entropy of the vapor is the only one needed). The class also went through the complete compression cycle with Dick as he drew it on the board. After doing this attendants were shown the different formulas and calculations which are used in order to determine compressor size to be used on certain jobs. Dick also explained the ammonia indicator diagram.

McKenna Talks On Maintenance

Chicago's Bert McKenna, chief engineer, Central Cold Storage Co., and NAPRE Vice-President, gave a talk on "Engine Room Practices and Procedures". This is the same talk he gave the NARW-TRRF conference at Purdue University in January. He explained the importance of keeping an accurate daily log in the engine room. If you ever have to look up something concerning temperatures or pressures or anything else that goes on the log, you will have it at your fingertips, he said.

Bert passed a few record cards among the members. These cards are kept on file in the Chief Engineer's office. On these cards there is a section for keeping a maintenance record. Any work that has been done on any of the equipment at the plant is entered on the equipment card along with the date and the name of the person that did the work. There is a section for keeping a record of a motor if one is involved, and a section for spare parts notes also. Bert explained that the cards have come in handy more than once for him. Understanding the men and having the men understand you is a very important item. In this way more work is done, there is less tension and everyone involved is happy. Bert also gave a few tips on Safety in the engine room.

President Nick Downes opened the March 13 business meeting. Secretary Bill Tiffin read the petition which the Chapter had drafted and then unanimously adopted, asking the National Board of Directors for the National Convention to be held here in Chicago in 1957. Gene Kelly and Bob Walsh, both from the Post Office, had an air conditioning layout and drawings for the Question Box session. They had a few problems concerning the air conditioning of some offices and wanted members' opinions. Questions were asked of them by the members and a few suggestions were made.

McIlrath on Humidity

The instructor for the educational class on March 13 was Chicago Chapter's own Jim McIlrath of U. S. Cold Storage Co., who pinch-hitted for the regular instructor. He gave instructions on Chapter 19, "Humidity in Refrigeration", from the Guy R. King course book. Jim related that temperature control is the first item of importance, and humidity second. He then explained the difference between Absolute and Relative humidity. He told that relative humidity is a better measure of how the air will affect other things. He explained that the lower the relative humidity, the faster is the moisture evaporation or drying action.

Jim then explained the use of the sling psychrometer. This consists of two thermometers, one with a wet wick around the bulb (called the wet-bulb thermometer), the other a plain thermometer (called the dry-bulb thermometer). When the two thermometers are twirled around fast on a swivel handle provided, the water on the wet wick evaporates causing a cooling affect on the bulb and bringing the temperature below the dry thermometer which has the room temperature. The drier the air the greater is the evaporation and cooling. After readings are taken from the dry-bulb and wet-bulb thermometers, there are charts or tables that give the relative humidity of the air.

One such a chart is called a Psychrometric Chart. Absolute humidity and the dew point can also be found on this chart. Jim explained how to use this chart. A few wet-bulb and dry-bulb temperatures were given, and the members found the relative humidity, absolute humidity and the dew point by using their charts. Questions were asked by the members as Jim was giving his talk, and he answered the questions at the back of the chapter. After McIlrath was through, he was given a rising vote of thanks for the excellent job he did on such short notice.— BILL O'REILLY.

Industrial Battery Topic At Mile-High Chapter

Denver—Battery users "Training Manual" for lead-acid motive-power batteries were distributed to all members and guests in attendance at the Denver Chapter, NAPRE, meeting on April 27.

According to Speaker Brown, a storage battery, contrary to the usual conception, does not actually store electrical energy. What it actually stores is chemical energy, which is converted to electrical energy when discharged. On recharging the electrical energy supplied to the Battery is spent in changing the active materials back to their original state, thus restoring the chemical energy necessary for another discharge. These changes are made possible by the mechanical design of the battery cell.

Battery Selection

Probably one of the most important factors in storage battery use for Industrial Trucks is proper battery selection, said the Speaker. When buying a new battery for replacement or for use in new equipment, it is always advisable to enlist the services of the battery company's representative or follow very closely the Electrical Truck Institute's method of selecting the proper capacity battery for the job it has to do. Many times mistakes have been made in selection because of lack of engineering before the sale was made. This may result in a battery of a capacity not great enough to do the job it was intended to do.

Although there was some small savings in original purchase price, the over-all cost skyrockets in loss of tonnage hauled, short working time and complete downtime as well as condemnation, sometimes of the entire equipment. The load, the length of haul, the list, the grades encountered all must be taken into consideration. Also enough reserve capacity must be included to take care of the unforeseen circumstances which may, and almost always do, arise.

Shows Battery Amortization

Brown used examples to show members how to estimate their battery operation costs. This is a typical illustration: with proper battery selection, care and maintenance, an owner may expect approximately 2000 charges and discharges before the battery must be replaced. Amortize the cost of an average fork lift truck battery. The cost is approximately $1200.00. Break it down to cost per shift for 2000 working shifts. It amounts to 60c a shift of 8 hours work. That is 7½c per hour for the power source in a fork lift truck. Of course, there's about 25 or 30c in current consumption for recharging, and about 10 minutes time per week consumed for maintenance. The total cost is less than $1000 per shift or less than 12½c per hour.

Battery Care

Maintenance instructions were reviewed and eight rules were given for battery care. New developments in battery construction were cited by Brown, and lease plans were briefly explained. The Training Manual itself contained data on battery functions, construction, selection, charging, charging methods and apparatus, testing, maintenance and repair; a welcome addition to any engineer's library.

President Mike Bistranin reported on arrangements for a Chapter field trip to the Pacific Fruit Express Company's 400 ton automatic ice plant at Laramie, Wyoming. Thus far, 16 members have indicated their intention to make the visit on Saturday, June 30. Mike also introduced the members who joined the Chapter in April; Russel Strasbaugh and Earl Burger, Maddox Ice Co.; Byrl Walker, Dolly Madison Creamery; Raymond Hertz, Rockey Mountain Dairy; Ray Heigh, Sterling Ice & Cold Storage Co.; James Hughart, Adolph Coors; Richard Reivitt and Billie Fowler from K. & B. Packing Co.

April 10 Meeting

Denver's April 10 meeting was held at the Beatrice Foods Warehouse. The Secretary-Treasurer reviewed membership progress and made a financial report. The chapter now boasts 65 members. Each new member was given a membership certificate. The Chapter President served as instructor covering Chapter 2 of Basic Refrigeration. It was also announced that the Chapter would make a tour throughout Coor's Brewery on September 11th.— HERBERT NELSON.

More Chapter Inquiries

Members-At-Large—Enthusiastic members such as C. Scott Johnson and A. C. Kniseley helped gratify the efforts which the National Officers put into the membership and chapter program. These two gentlemen developed prospects of chapters which look very promising. Johnson, President of the new Tampa Chapter, is taking the initiative in forming a new chapter in the city of Jacksonville.

Another prospective chapter is in the early organizing stages under the direction of A. C. Knisely, Richmond, Virginia.

Past President E. T. Quinn has interested a group at Delano, California in forming a chapter. Hubert Branham, National Director, also a member-at-large, has been lending his assistance in an effort to form chapters at Boise and Nampa, Idaho.

It might be of interest to members-at-large, or chapter members, called into the armed services to know that a resolution passed in 1942 by the Board of Directors setting an annual dues of $1.00 for military membership, is still effective. This nominal dues remittance keeps membership records continuous for those called to active duty. It entitles such members to continue receiving Industrial Refrigeration magazine if they forward their military serial number and address.

The wife of a good member abroad, Mrs. Muriel Steggel, in England, writes: "My husband has now been promoted to General Service Manager and is so busy that he cannot even find time to write and let you know his new address. We have moved over here to be nearer the job and I hope you will now cancel '79 Newbury Gardens, Upminster Essex' and make sure that all correspondence is sent to the new address. We do not want him to miss anything concerned with NAPRE. We feel that the association has helped a great deal in his promotion and hope it won't stop there. We hope to be able to come over to America".

A number of members-at-large have recently been admitted to membership in our association. LaVern A. Grafelman, a member-at-large in East Peoria, Illinois, is chief engineer for the Icing Plant of Toledo, Peoria and Western Railroad Company. In Ogden, Utah, another member-at-large is Carl B. James, an electrical repair man for Pacific Fruit Express. Carl's work involves him in maintaining ice plant equipment and includes repairing mechanically refrigerated cars.

New member Bernard Edmondson is the refrigeration and air conditioning engineer for the RKO Chester Theatre at Broadway, N.Y.

A member-at-large from the Oregon area is Hayden D. Smithson of Smithson Electric. This new member-at-large has also inquired into the prospects of forming a chapter for his area. A member from Boston, Mass., recently admitted is Augustus B. Panza of the Boston Edison Company. Mr. Panza was in the same refrigeration course in upstate New York recently with Chicago's President, Nicholas M. Downes and Detroit's Vice-President, Leonard Bedard. Thanks to their alertness, Panza was interested in membership in NAPRE. —Frank Chase.

St. Louis Elects Officers

St. Louis—Officers for the 1956-7 term were unanimously elected at the April 16th meeting of the St. Louis chapter, held at the N. O. Nelson Company, a compressor and parts manufacturing firm. A nominaitng committee composed of Charles Wunderlich, Gurdon Uplinger, and Les Fleiter recommended the slate which was unopposed. E. Kessler, Falstaff Brewing Corporation, was elected President. Vice-President is Charles Good; Secretary, Ed Hughes; Treasurer, H. Reichenbach; Sgt. at Arms, Pete Orlando; Director for two years, H. Proemsey. Junior Past President Ed Lotte was elected as Director for three years.

Speaker for the evening was J. Decker, St. Louis representative of the Jenkins Bros. Valve Company, who lectured on the different types of valves and their proper uses. Following the discussion members were taken on a tour of the N. O. Nelson compressor refrigeration division. Consensus was that the Nelson establishment was quite large and insures St. Louis customers of a ready supply of equipment and parts. A number of attendance awards were distributed, prizes going to Ed Lotte, R. Miller, Ray Cambron, and H. Sutter.

Plenty of pretzels and the famous St. Louis amber liquid was on hand, adding more enjoyment to the evening.—Ed Lotte

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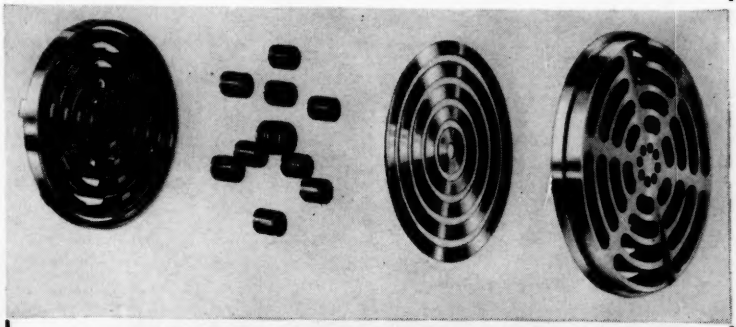

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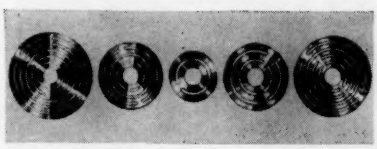

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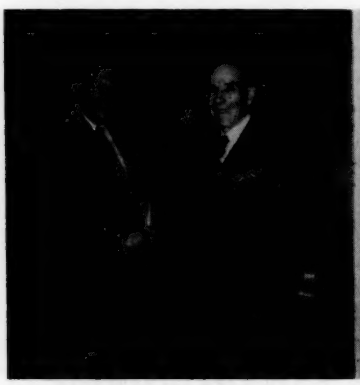
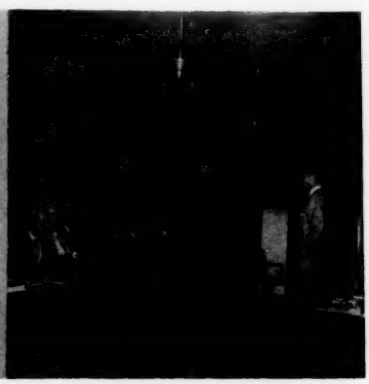
Detroit Tours Gelatin Plant

Detroit—Gelatin products require refrigeration or temperature and humidity control of air supplied to process areas. Further, certain ingredients for capsules, coated pills, etc. require refrigeration prior to manufacturing. Some processes require chilled water, again bringing refrigeration into the picture in this enterprise. Members of Michigan Chapter No. 1, witnessed the practical application of many of these when the chapter made an inspection trip through the R. P. Scherer Corporation, Gelatin Products Division.

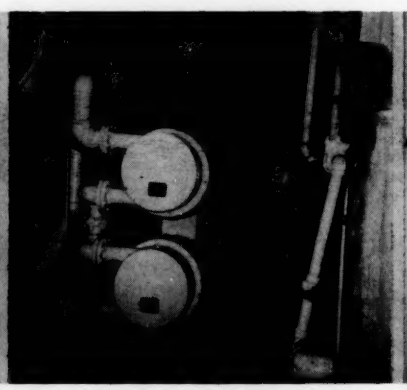
To maintain close humidity control and to provide for constant defrosting in lower temperature applications, Kathebar lithium chloride coils and air washers are used in this plant. Original installation involved several 40-ton Westinghouse hermetic reciprocating compressors using dichlorodifluoromethane. Recent additions to the plant was in the same type of compressor in larger tonnages using monochlorodifluoromethane as a refrigerant. Total tonnage of the plant amounts to more than 500 tons. Executives of the R. P. Scherer Corporation addressed the group prior to the plant tour and answered questions following the trip. They agreed to cooperate in furnishing a complete refrigeration story to the official organ of NAPRE. Prior to this meeting members of the Convention Committee met with the National Secretary and Robt. Kruppe of Chicago.—L. ADAMS.

Dinner meeting of Convention Committee at Detroit was caught by the candid cameraman. Peter Svayla, chief engineer of the Statler Hotel has his back to the camera in the foreground; next is the National Secretary, Dick Kelahan, Mrs. R. T. Burns and Mrs. Leo C. Gage. Looking at the birdie over the top of Svayla's head is Bob Kruppe, Chicago Chapter, while Roy Burns, a National Director and Convention Chairman, smiles his approval from across the table. In the photo at right Chapter President Charles Heemstra presides over the Convention Conference which is graced by the presence of the ladies who reported in detail on their part of the program.





One of the members who put in his surprise appearance at the Gelatin Products plant tour, was Arthur O. Smith, a past president of the Detroit chapter. Smith had retired due to a severe illness and surprised many of his old friends with his appearance. Charles Heemstra, chapter president, welcomes him aboard. Center; view of the NAPRE tourists. The firm treated to light refreshments. At right, Jack D. Scherer of the Gelatin Products Division, addresses the members and makes them welcome.



Snapshots of the Gelatin Products plant taken during the recent Detroit Chapter plant tour. At left is the photograph of two of the V-8 type reciprocating hermetics used by this firm for process and air conditioning. In the center picture are some heat exchanger vessels used in connection with process cooling; at right is pictured a portion of the Kathebar unit with the regenerator in the background. Although the black and white photos do not show it here, this plant follows the ASA-ASRE Standard Color Code in the identification of compressed air, refrigerant, fire, lubricating oil and chilled water piping.

Frozen Foods Industry In Los Angeles Spotlight

Los Angeles—Some illuminating figures on growth of the frozen food industry were presented by George R. Wachter, Vice-President, Freezing Equipment Sales, Inc., York Pa., the featured speaker at the April 4th meeting of Los Angeles NAPRE Chapter, which was held in the Terminal Club. Wachter gave a review of the tremendous expansion of frozen food processing, told of the important role refrigeration plays in the industry and, on the mechanical side of the subject, discussed low temperature refrigeration compressor applications in the food industry.

He told of the methods in vogue 20 years ago and declared that the real story of freezing food dates to World War II when the government made unusual demands for frozen foods for military purposes. "It involved a lot of trial and error to develop low temperature compressors to the advanced stage we know them today," Wachter said. "Today, when practical engineers speak of low temperature, they are usually referring to its use in the food industry. Extremely low temperatures were rare in this field up to 20 years ago, and by the time World War II came along a minus 30 F. was rare. It is almost standard practice in many phases of food processing today."

The refrigeration system is one of the most important cogs in the business. To produce the necessary quality in the final product—frozen meat, vegetables, fruit or seafood—refrigeration equipment plays a major role in the phases of production and distribution: "First, of course, the necessary refrigeration machinery must be used for proper freezing. Then there must be available space to store the food in a frozen state; more refrigeration; then protect the food by refrigeration during transit; and finally, maintain it in its frozen state until it reaches the ultimate consumer and is eaten."

Frozen food production, Wachter indicated, increased from 268 million pounds in 1938 to 3,993,000 pounds in 1954. During the same period, the processing of frozen seafood increased from 48 million to 450 million pounds; frozen vegetables from 130 million to 550 million; and frozen fruit from 73 million to 1,100,000,000 pounds. "In 1938," Wachter said, "there were 737 processors of commercial frozen food in the United States. This figure has nearly doubled to 1434. Potential expansion of this industry is closely related to population increase estimates, which is predicted at 200 million by 1975. By that time, only 19 years away, we will need 510 million cubic feet of freezer space, or virtually double the space now available."

The speaker also cited some figures tending to show that by 1960, 50 percent of all meat processed in this country for human consumption will be frozen meat. In the liquid category, he quoted predictions of a prominent mid-western brewery official, that by 1975, 55 million Americans over the age of 21 will be beer drinkers, which presages a tremendous demand for refrigeration by the brewery industry during the next two decades.

Chapter President Clifford P. Scott presided over the business session at which William Metz of the Ventura Farms Frozen Food plant was taken into membership. N. P. "Phil" DeSantis, chairman of the membership committee, included some dire news in his report on the membership drive. Phil announced that the committee in charge of the drive had decided that all members who fail to sign up at least one new member will be drafted for duty as waiters and bus boys at the ham-and-beans dinner which will be the feature at "Old Timers' Night" on June 15. Membership prizes, DeSantis reported, will be awarded in three classifications: those signed up by members in the 1922 to 1940 bracket, 1940 to 1950, and 1950 to 1956. Numerous secondary prizes as well as a grand prize in the form of a rod and reel will be awarded.—F. HERR

Mid-South Concentrates on Refrigeration Course

Memphis—Practice of this chapter has been concentration on Basic Refrigeration at each meeting. Members at meetings of May 2, April 18th, and April 4th were instructed by Mr. H. L. Todd. Todd covered a section on Flow equipment at the first April meeting, using samples of equipment which he had brought along. He covered also some of the smaller vessels such as oil separators and various heat exchangers. Receivers were discussed at length, and liquid gauges provoked several questions.

At the second April meeting, he continued his discussion covering electrically controlled valves. A "chalk talk" at the blackboard helped put over the more important points. In May, his topic was devoted to lubricating and oiling devices, and included the presentation of several types of oilers and oil pumps. He stressed the importance of using the correct type of oil and emphasized that it should be kept completely moisture free.

As has been the custom, Chapter President J. H. Robinson, presented motion pictures for the lighter side of the meeting. His April topics dealt with the invasion of several Islands on D-Day during World War II, and some pictures which he had taken himself while in Service. These started many of the boys to reminiscing. At the May meeting he showed a picture of a pump that he had designed for use by surgeons at his hospital, which would keep the circulatory system in operation while the heart is being operated upon.

Another interesting aspect of the meetings recently has been the awards presented to various lucky engineers for keeping up their attendance records. They have included hand tools which had been given to the Chapter by Boland Engineering Co., Gordon Hollandworth, Pittsburgh Paint Co., and Dawkins Electric Co.

Joseph E. Tracy was elected to membership. He is the assistant superintendent of the power plant division of the Tennessee Valley Authority steam generating plant in Memphis.—CHARLES CONLEY

Officer Installation and Texas Family Party

Rio Grande Valley—Officiating at the installation of new officers in the Rio Grande Valley Chapter was Mr. Angus Casberg. At a special family party he charged the following new officers with faithfully discharging their duties and responsibilities of office. He reminded them that the survival and growth of the chapter now rests in their hands. The elected were President, Rube Keener; Vice President, Clyde Young; Secretary, Barney Majesky; Treasurer, Olen Fisher; Sergeant-at-Arms, Oscar Ransom; Director, Encarnacion Contreras.

He also charged the membership with the duty of supporting and backing their new officers and reminded each member present that he would receive benefits from his membership in NAPRE only in proportion as he gave of himself and applied himself during regular attendance. He praised the loyal backing of the ladies, and the execellent buffet supper served by them for the festive occasion. The Chapter's thanks were extended to Mr. Law and Mr. Bourdon of Corpus Christi branch of Barada & Page Chemical Company for beverages, as well as to Mr. Mcleod of the Joe Summers Co. of Mission, who represents Cutler-Hammer. The award to the lady with the most infectious laugh went to Mrs. Casberg whose hearty laughter set the crowd into a gay participating mood. Mexican music was played by the Sanchez brothers and a merry mixture of grace and comedy was exhibited by some impromptu dancing by Mr. Casberg and Mrs. Mary Doneis.

The death of Charter Member, Russell M. Sawyer, was reported at meeting of April 3. Our Chapter expressed its sympathy to Russell's family with a suitable floral wreath, and a large number of chapter members attended the funeral.—ARMIN F. DONEIS

Motor Building Witnessed

Corpus Christi—Refrigeration took a back seat to members' electrical problems as the chapter's topic on March 16. The chapter gathered at the Bradley Armature and Electric Works for doughnuts and coffee and a brief business meeting. The group was conducted on a tour of the vast electric motor works. Mr. Bradley gave a thorough lecture on strip heaters for keeping large motors dry while not in operation, on instruments for testing electric motors and finding their troubles and on increment starting of larger motors.

Then there was an actual demonstration of shaping of coils for large motors. A large number of motors were laid out in exploded fashion so members could really examine them. Their faults and their capabilities were discussed thoroughly. The real show was the demonstration of the vibration analizer and balancing machine that has been recently installed in the shop. The need for more of these programs was immediately recognized by all present.—DAN CHAPMAN

NAPRE

Question Box

The National Educational Committee, NAPRE, answers monthly in this column, operating problems forwarded by members. The Committee appreciates answers from the field. Address questions and answers to Prof. Harold P. Hayes, Dean of Engineering, State Polytechnic College, San Luis Obispo, Calif.

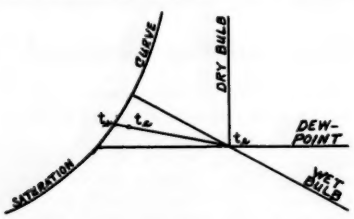
Doubts Humidifier Effective Under Winter Load Condition

QUESTION NO. 1109: How can I present proof of possible water and steam savings to be accomplished in the winter-time operation of our industrial air conditioning equipment? We mix return air and fresh air, filter it and deliver it at 65 F to a spray chamber. Water is from city mains at 45F and wasted after this use. From this humidifier the freshened air goes through eliminators and a (steam) reheat coil. Then back to equipment rooms at 65 F, and minimum 40% — maximum 55% rh.

It seems that water can be saved by adding a mixing valve and introducing heated water, resulting in 70 F water at sprays. Steam would be saved as less reheat would be required. An average of 50,000 cfm per unit, and several units per building are involved. Why not recirculate the spray water?—N.M.D., Chicago.

ANSWER: The suggestion which you make would raise the humidity of the leaving air and hence the humidity of the room. You would, therefore, have to weigh any advantages in fuel savings against the undesirability of increased humidity. The following discussion may help to clarify this point:

The dew-point temperature of the leaving air approaches the temperature of the water which drops to the pan of the washer. The percentage approach from the entering air temperature to the leaving water temperature is called the saturation efficiency or contact efficiency of the washer. A washer may either humidify or de-humidify the air depending on whether the leaving water temperature is above or below the dew-point temperature of the air. The process can be shown on a psychrometric chart and is illustrated in the following diagram:



t_e = air temperature of the mixture entering the washer.

t_c = temperature of the conditioned air leaving the washer.

t_s = surface temperature of the water droplets in the washer.

(This temperature approximates the water temperature which drops to the pan.)

$$\frac{t_c - t_e}{t_s - t_e} = \text{contact efficiency of washer.}$$

A washer with a single bank of sprays usually has a contact efficiency of about 70 percent while a washer with two banks of sprays usually has a contact efficiency of about 90 percent.

From the above diagram it will be seen that the addition of any heat to the water will raise the dew-point temperature of the air leaving the washer, while any heat taken away from the water will lower the dew-point temperature of the air leaving the washer.

From the diagram it will also be seen that the dew-point temperature leaving the washer can also be modified by changing the ratio of outdoor and recirculated air quantities thus changing the position of the point t_e representing the condition of the air mixture entering the washer.—N.S., San Luis Obispo, Calif.

pH Test Supplies Sought

QUESTION NO. 1110: How would a person proceed to equip himself with pH testing facilities and procedure instructions in the average industrial plant? S.A.C., Chicago.

ANSWER: Write to a laboratory supply house (Central Scientific Co., E. H. Sargent & Co., and others in Chicago).

Color comparators with test tubes and indicator solutions are available at prices as low as $20. Instructions are generally furnished with the kits.

Each indicator covers a short range of pH values, and one or two sets of color standards would be enough for brine testing. For general use to cover a wide range from strongly acid to strongly alkaline conditions, as many as a dozen sets of standards might be needed. For production work where many tests are to be made with accuracy over the entire pH range, an electrometric instrument may be needed. These are considerably more expensive than the simple comparator kits. — K.M.H., St. Louis, Mo.

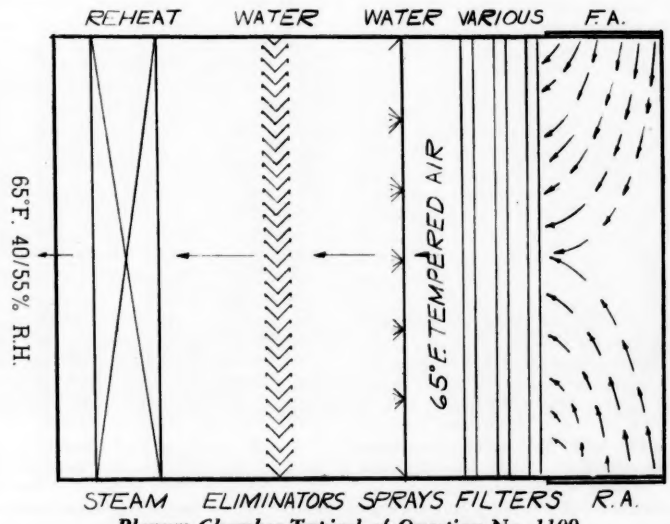
Questions Inhibitor Use For NH_3 Refrigerating System

QUESTION NO. 1111: Has anyone heard of or seen, or used, an inhibitor in liquid NH_3? The party bringing the inquiry is not an operator, but insists that at some location (exactly where he cannot now recall) in his travels, an engineer was using one.

To what end, or for what purpose, would one use an inhibitor anywhere in an NH_3 refrigeration system?—H.T.McD., Chicago

ANSWER: The use of inhibitors in an ammonia system may be to prevent chemical corrosion of metals that are amphoteric in nature. It is common knowledge that metals corroded by acids but certain metals such as aluminum are attacked by either an acid or alkaline substance. This property is referred to as amphoteric. If the ammonia system in question was fabricated in part with an amphoteric metal the ammonia and water vapor in the system could conceivably combine chemically with the metal causing a failure in the system even though the ammonia is alkaline and will not corrode the normal materials of construction such as steel.

An inhibitor in the system might prevent this corrosion by minimizing the chemical attack and thus maintaining the system in perfect operating condition. Most ammonia systems will not require the use of inhibitors as the normal materials of construction are not attacked by ammonia and water.—J.A.McI., Chicago, Ill.



Plenum Chamber Typical of Question No. 1109

Large Hermetic Centrifugals Spark Refrigerant Inquiries

QUESTION NO. 1112: American Blower Company announced a new single stage hermetic centrifugal refrigerating machine called "Tonrac". They say it uses "Freon-113" as a refrigerant. This I suppose would be the same as "Genetron-226". What would Carrier call it? "Carene-7"?

Why is the "Freon-113" so adaptable to hermetic units; or maybe I should put the question this way: Why have manufacturers gone to hermetics in this field, the unit type water chiller? Is it because the machines with this refrigerant run in a vacuum? What are the characteristics of "Genetron-226" that makes it so desirable for package chillers for air conditioning purposes?—C.H.H., Detroit.

ANSWER: "Freon-113" and "Genetron-226" are basically the same refrigerant, but "Carrene-7" is different. The latter is an azeotropic mixture of "Genetron-100" and "Freon-12". "Carrene-3" would be closer to the other two.

Machines using trichlorotrifluoroethane ("Freon-113" or Genetron-226") are hermetics because they operate at a vacuum (usually 20 to 25-in.Hg on the low side and 10-in. Hg on the high side for typical air conditioning applications) which would cause seal problems in many conventional systems.

Trichlorotrifluoroethane is highly desirable for centrifugal machines because the pressure difference between given evaporator and condenser temperature is relatively small. This means that fewer stages are required to raise the refrigerant pressure from the low side to the required high side value.—N.S., San Luis Obispo, Calif.

Railroad Units Minus Driers

QUESTION NO. 1113: Why should a leading refrigerator manufacturer prohibit the use of a drier on equipment for the new mechanical refrigerated railroad cars?—S.A.C., Chicago.

ANSWER: All cars the Pacific Fruit Express Company have are equipped with a cartridge type drier built into the system. We have Frigidaire, Carrier and Trane. I cannot speak for the Thermo King, because we do not have any. Without it moisture causes the expansion valves to freeze and clog with ice.—L. Etzel, PFE, San Francisco.

New Questions

Are Manufacturers Compelled To Market Replacement Parts

QUESTION NO. 1114: Is there any Federal Statute or law that compels a manufacturer to maintain replacement parts available for any length of time after a piece of equipment is placed on the market?—D.Z., Chicago, Ill.

Needs "Therm" Definition For Gas Bill Calculations

QUESTION NO. 1115: In our refrigerated warehouse, we operate a small gas-fired package boiler for heating of the offices in the winter time and for brine heating for defrosting purposes. In the summertime a little gas heater is used for brine heating.

Since taking over as chief, I find that my gas consumption is reasonably constant, considering weather fluctuations, etc. However, factors used in computing the charges, as indicated on the gas bill, vary from month to month. I do not understand the reason for this variation. Perhaps one of our readers could explain it, as the representative they sent down here from the Gas Company does not seem to be able to clear it up for me.

On one month's bill they show therms per 100 cubic feet as 1.020; and the next month they show this figure as 1.025. In the first month's bill they show "a purchased gas adjustment of 49/100 of a cent per therm"; and the following month this figure as 57/100. What do these terms mean and how are the used to compute our charges? —F.L.B., Oak Park, Ill.

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Here's extra profit for your ice service . . . helping shippers, wholesalers and warehousemen preserve perishables —in storage or en route. And a Link-Belt Ice Crusher-Slinger is your best means for getting your share.

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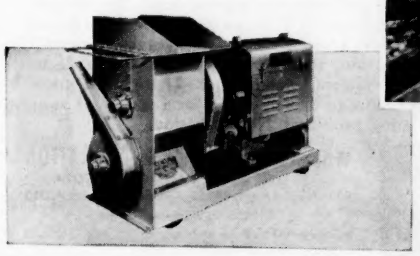

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Absorption Refrigeration By Solar Heat Conversion

QUESTION NO. 1116: Could you use solar heat to produce power and energy to run an absorption system?—M.H.S., Tampa, Fla.

Seeks Construction Data On Lobster Tank Refrigeration

QUESTION NO. 1117: How can I obtain information on building a lobster tank? The tank is made from plexiglass with no insulation — 6 ft. x 3 ft. x 15 in. high, using 100 to 125 gals. of sea water which is changed once a week. Data on the following would be appreciated:

(1) The size of pump — gals. per min.
(2) Kind of refrigeration coils
(3) Heat load
—O.H.N., New Haven, Conn.

Creating Energy

QUESTION NO. 1118: Can energy now be created?—M.F., Denver, Colo.

Storage Facilities Enlarged

THE FROZEN food storage facilities of Bishop Co. Inc., Buffalo, N.Y. will be tripled with construction of a $200,000 addition to the company warehouse at the Niagara Frontier Food Terminal.

National Ice Conferences

DURING April divisional conferences were held by the National Association of Ice Industries in Seattle, Santa Fe, New York and Boston. Emphasis this year was on management problems. The association had assembled some figures on the breakdown of costs of selling ice through vending stations, manually operated outlets and through retail stores. These were used to open the round-table discussion of the problems and opportunities of these outlets for members of the industry.

On the production side, many manufacturers over the country are doing outstanding jobs of reducing their manufacturing and processing costs. A photo-slide resume of these operations was used to set the pattern for considering these problems.

The Seattle Conference was held in connection with the Northwest Association Convention. It was attended by icemen from Washington, Oregon, California, Vancouver and Victoria.

The Santa Fe meeting was held in conjunction with the Mountain States Convention. It was attended by ice people from New Mexico, Nevada, Colorado, Montana and Texas. The session was moderated by L. L. Belcher of the Mountain Ice and Coal Company of Pueblo, Colorado.

The New York City meeting was held April 25 at the Lexington Hotel. It was exceptionally well attended by ice manufacturers from New York, Pennsylvania, Delaware, Maryland, New Jersey, Connecticut and Virginia. P. A. Buehrman, American Ice Company, New York City, and member of the NAII Executive Committee, served as moderator.

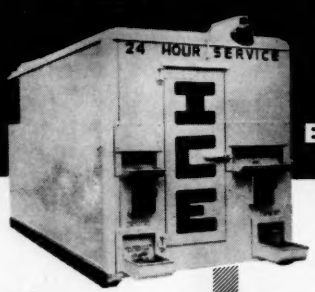
C. P. Austin of the NAII staff participated in all of the Conferences and Guy W. Jacobs attended the New York and New England meetings.

During May similar conferences were held as follows: Austin, Texas—The Commodore Perry Hotel, Friday, May 18; St. Louis, Missouri—The Coronado Hotel, Monday, May 21.

Correction

WE regret that inadvertently, an error was made in item on page 9 of the April issue reporting the equipment to be used for air conditioning the Palmer House, Chicago. The item should have stated that York equipment will be used rather than Carrier, as stated.

S & S



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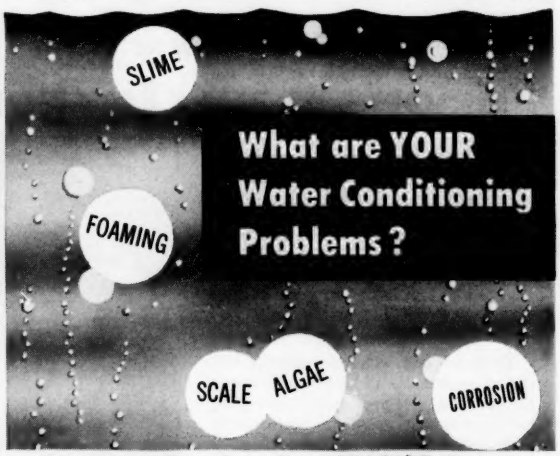

Be Sure You Get the WRIGHT Answer

Because water conditioning problems are individual, no one "cure-all" solves them all. The Wright method discovers *which* detrimental factors are characteristic of your water system and treats the specific condition. Wright Service provides a study of *your* water problem, a laboratory analysis is made, a written proposal gives recommendations for the solution, then frequnt checks are made to assure continued efficient performance. There is no guess or experiment. Write or call us today for a survey of *your* water conditioning problems. No obligation.

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Florida Ice Industry Battles Accidents in Operation

THE Florida Ice Association, aided by the Florida Industrial Commission's Safety Department, is not letting up in safety efforts which stem from a special campaign to cut accidents started in 1954. That program brought achievements far beyond expectations of officials in the Association.

Accidents cut in half; lost work time reduced to one day for each five lost in 1953; 37 cents saved per dollar of accident costs paid out before then; and workers saved the pain of work injuries, were some of the high points. It did another thing, too. Surprisingly enough the industry found out, through intensive analysis of accidents, facts about itself that it did not know before. And this information is providing some of the basic ammunition for a continuing war against accidents.

One of the important phases of the follow-up program is in special regional meetings co-sponsored with the Industrial Commission throughout Florida. Also important in this all-industry safety effort are the quarterly reports participating ice plants make to the Industrial Commission, listing their man hours worked and their injuries. Reports based on this information strike home to operators when they actually see in graphic illustrations, the periods when injuries tend to increase, and the reasons.

From this data, an Industrial Commission safety representative gives the overall picture of what is happening—how many employees are getting hurt; what are the costs in workmen's compensation, medical expenses, and in time lost to employee and employer. Any recently reported, serious injury is analyzed in detail so that industry officials will know what to do to prevent such accidents from recurring.

Because vehicle safety is a major and continuing problem in the industry, from the viewpoints of both public liability and worker safety, a Florida Department of Public Safety representative gives talks and shows films at each meeting on vehicle safety.

Another phase of these regional programs is instruction by a Red Cross Representative in emergency first aid, what to do when a man gets hurt. The industry knows that an ounce of prevention is worth a pound of cure, but it knows also that when an injury does occur, the better the treatment the employee gets on the spot the less will be his suffering and the lower the medical costs.

The regional meetings help the industry "shore up" for safety and one aspect of doing so is through recognition of those plants with the best safety records. The Industrial Commission awards an attractive certificate to each plant which has gone through the year without a disabling injury. The Florida Ice Association awards an engraved bronze plaque to the safest plant in each of four size groups. The ice plant owners and employees are justifiably proud when their plant wins an award.

Ice Man Sells Punch Bowls

AN enterprising ice man, George Heath of Oscar Mayer Ice Service, Madison, Wisconsin, prepared an attractive colorful punch bowl card and mailed one to the chairman of the "Prom" Committee of every high school within a radius of 75 miles of the City of Madison. The response was gratifying—sale of 37 punch bowls.

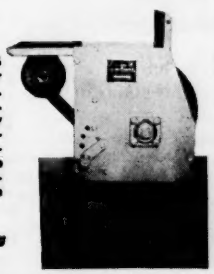
Bateman Makes Efficient Low Cost Ice Crushers For Every Purpose

Long life dependability is built into every Bateman Ice Crusher

Heavy duty Monarch model 50. Grinds 50 pound block of ice in six to ten seconds. $250.00, less motor.

Regal Model 25. For platform sacking or paper bags or general use. $160.00, less motor.

Bateman 25 CROWN. Ideal for Ice Stations . . . Vendors . . . Small Store. Only $130.00 (including 1/3 HP motor) Available with Wall Brackets or Platform Legs.



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Bateman Ice Processing Equipment

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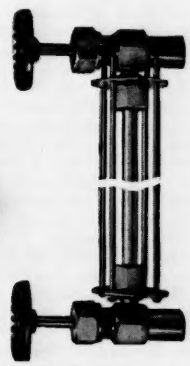

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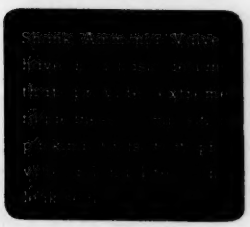
RELIEF VALVES for Ammonia and Freon. Positive relief action. Pressures from 75 to 300 lbs.



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F T C Trade Rules For Refrigeration and Air Conditioning Contractors

(Continued from page 23)

competitors of such industry member, where the effect of such sale or contract for sale or of such condition, agreement, or understanding, may be to substantially lessen competition or tend to create a monopoly in any line of commerce.

Rule 15 — Prohibited Forms of Trade Restraints (Unlawful Price Fixing, Etc.)[2]

It is an unfair trade practice, either directly or indirectly, to engage in any planned common course of action, or to enter into or take part in any understanding, agreement, combination, or conspiracy, with one or more industry members, or with any other person or persons, to fix or maintain the price of any goods or otherwise unlawfully to restrain trade; or to use any form of threat, intimidation, or coercion to induce any member of the industry or other person or persons to engage in any such planned common course of action, or to become a party to any such understanding, agreement, combination, or conspiracy.

Promulgated by the Federal Trade Commission May 8, 1956.

Robert M. Parrish,
Secretary.

[2]The inhibitions of this rule 15 are subject to Public Law 542, approved July 14, 1952 - 66 Stat. 632 (the McGuire Act) which provides that with respect to a commodity which bears, or the label or container of which bears, the trade-mark, brand, or name of the producer or distributor of such commodity and which is in free and open competition with commodities of the same general class produced or distributed by others, a seller of such a commodity may enter into a contract or agreement with a buyer thereof which establishes a minimum or stipulated price at which such commodity may be resold by such buyer when such contract or agreement is lawful as applied to intrastate transactions under the laws of the State, Territory, or territorial jurisdiction in which the resale is to be made or to which the commodity is to be transported for such resale, and when such contract or agreement is not between manufacturers, or between wholesalers, or between brokers, or between factors, or between retailers, or between persons, firms, or corporations in competition with each other.

Air Conditioning Show

THE 13th International Heating & Air Conditioning Exposition will be held in Chicago, February 25 to March 1, 1957. The exposition will be held under the auspices of the American Society of Heating and Air-Conditioning Engineers in conjunction with the Society's 62nd annual meeting. In view of the industry's rapid technological advances, displays of exceptional novelty are anticipated, fully occupying the great International Amphitheatre at Chicago.

Modern Hotel Guest Calls for Services

(Continued from page 28)

center for the installation. A remote indicator-control board is to be located in the chief's office, but a shutdown by any safety equipment, a sequence changeover, or initial start of the plant must be accomplished from the actual equipment room. Elaborate dual safety devices on the refrigerant, condenser and chiller water, and lubricating oil systems will shut the system down in event of non-design operations.

System is designed to deliver 45 F chilled water to the piping system at 35 F suction and 55 F return water temperatures. Each unit contains 314 lbs. original charge of monochlorodifluoromethane. The four chillers, with two coils each, allow as little as one-eighth total demand to be handled. Control is such that none of the units will be starting across the line with another.

The new transformers are equipped with disconnects to remove them from the Edison network when the air-conditioning system is out of operation in winter months. This prevents hysterisis and other losses from being charged to the Hotel demand. Circulating water pumps are arranged to be supplied current from the new transformers in cooling season, and from the older electrical busses during the heating season when they are used for other standby purposes.

The 12 complete supply and exhaust air handling systems range from 4,000 cfm to a 45,000 cfm unit that supplies the main kitchen area. A central Spencer vacuum system, also located in the engine room, is used to maintain daily vacuuming of the guest rooms, all corridors and function rooms.

New Standards on Air Conditioning Equipment

TWO new standards on the testing and rating of air-conditioning and refrigeration equipment have been drafted and released by the Air-Conditioning and Refrigeration Institute.

The first (ARI Standard 410-56, "Forced Circulation Air-Cooling Coils") specifies minimum requirements for forced-circulation air-cooling coils for application under nonfrosting conditions and applies to air-cooling coils using either water or volatile refrigerants. This Standard includes minimum equipment, methods of rating and testing, design, construction and safety provisions.

The other (ARI Standard 411, "Standard for Methods of Testing and Rating Forced-Circulation Air-Cooling and Air-Heating Coils") prescribes methods of testing and rating both air-cooling and air-heating coils to assure uniform capacity information on the coils.

ARI Standard 411 also describes and specifies the basis of rating, test equipment and apparatus, test methods and procedures, test data, calculations to be made from test data, and a definition of terms to be used in testing and rating of equipment.

Ninety Year Old Brewery

(Continued from page 18)

for the winter months is to use the 25-ton unit on both beer and wort cooling, then cut in cellar cooling after wort operations cease. Summer practice is to use the 50-ton unit in this manner, with an assist from the 25-ton machine during hot weather extremes.

Processing operations usually require a suction pressure of 20 psig. Cellar operations are handled at 35 psig. During processing operations, the higher suction system may now be direct-connected to the smallest compressor, which operation is believed would promote even better efficiency in the plant. Prior to this alteration, suction pressures were five to 35 psig.

Another innovation in the plant is the arrangement for operating the 50-ton compressor from an electric motor drive when the steam plant is down or when maximum steam capacity is required for other purposes. By removing two coupling bolts and placing belts over appropriate sheaves, an electric drive is provided for this compressor and the steam engine remains idle (See Fig. 1). Changeover time? Not over 5 minutes!

New York Office Building To Be Air Conditioned

THE 15 Broad St. Corp., wholly-owned subsidiary of J. P. Morgan & Co., Inc., has awarded a contract for installation of air-conditioning equipment and various alterations to the office building at 15-21 Broad St., New York, a forty-story structure.

The principal structural change will be a cooling tower installation at the top of the building.

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*DOW EXPANDED POLYSTYRENE PLASTIC

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FIRE-BAN Adhesive sets to rock-like hardness in a permanent bond that defies separation . . . even by force!

Direct Adhesion has proved its unfailing practicability on ceilings of poured concrete and pre-cast panels. A tenacious bond is assured also on firmly adhered cement plaster, cellulose board, rough lumber, Sheetrock and unfinished plywood. Fire-Ban Adhesive firmly bonds "Styrofoam" boards up to 6" thick, also additional layers of "Styrofoam" with joints staggered.

Direct Adhesion may be applied to ceilings of non-porous surfaces such as metal, finished plywood or lumber, painted or asphalt coated surfaces by first preparing such surfaces with a quick coat of O'Neill's "Filmcote"

The use of Fire-Ban Adhesive on wall installations has long been accepted as standard procedure. The same Direct Adhesion to ceilings (where "Styrofoam" is specified) has already gained such wide acceptance that you will want to know the details.

WRITE AT ONCE FOR "BULLETIN 34" for full details, methods of application under varying conditions, costs, list of applications to date, etc. Specify if you want a "Bonded Sample" for testing. Address . . .

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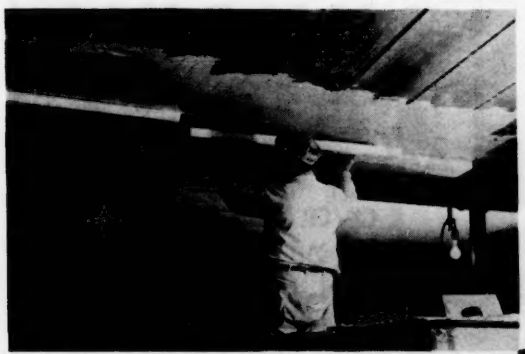
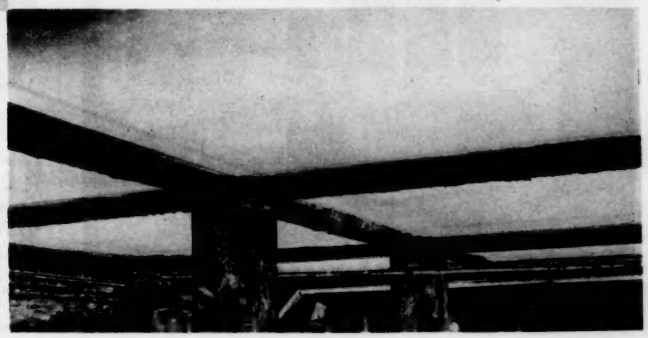
"Bulletin 34" with "working" photos, detailed recommendations, list of installations, etc.
Also get free "Bonded Sample" for your own tests.



This photo shows Direct Adhesion to a ceiling of pre-cast panels; the photo at the top of the page shows application to a ceiling of poured concrete. Requires nothing more than a quick application of Fire-Ban Adhesive to both contact surfaces and the "Styrofoam" boards are simply pressed into position. That is all! The adhesive sets in approximately 24 hours and the bond becomes inseparable.

• • •

Photo at right was taken immediately after the insulation was coated with Fire-Ban Finish. This permanent, stone-hard, washable surface coating (the non-combustible coating "listed" by U. L. and considered "safe" for food plants by B.A.I.) is the number one consideration of engineers for ceilings and walls subject to extreme temperature conditions. For details of Fire-Ban surface coating, send for Bulletin No. 55.



Illinois Holds Annual Spring Conference

THE Annual Spring Conference of the Illinois Association of Ice Industries was held at Centralia, Ill., April 6. Subjects covered and topics discussed included: Manufacturing, processing, vending, public relations, trade promotion and marketing and salesmanship. The session ended with a free discussion of various industry problems. Associate members present were very helpful in telling of the things being done in the field they serve, many money saving, cost cutting ideas were explained by both the suppliers and the icemen.

At the close of the discussion period, directors were elected and they in turn met and elected officers as follows:

President; J. P. Maguire, Decatur, Ill.

Vice-President; Karl Pflanz, Belleville, Ill.

Secretary and Treasurer; W. D. Wright, Clinton, Ill.

Directors: James Oldani, Springfield, J. P. Maguire , Madison, Wisc., Jack Smith, Galesburg, H. J. Weindell, Chicago, Karl Pflanz, Belleville, L. A. Davis, Peoria, Charles Lamb, Herrin, G. C. Benson, Harrisburg, Richard Beard, Danville.

Mountain States Ice Convention

THE 39th annual convention of the Mountain States Association of Ice Industries, was held at the La Fonda Hotel, Santa Fe, New Mexico, April 19 through April 21. As the first order of bsuiness, tributes were paid to the memories of J. Reimer Espy and Frank Adams, past officers of the Association, who passed away since the last meeting.

The National Association presentation by C. P. Austin was very well done and as in the past stimulated considerable discussion. The banquet Friday night was well attended.

The present officers were re-elected:

President, R. L. Belcher, Pueblo, Colo.

Vice-president, Waldo Todd, Santa Fe, N.M.

Secretary, J. Bruce Espy, Denver, Colo.

Regional President, L.L. Belcher, Pueblo, Colo.

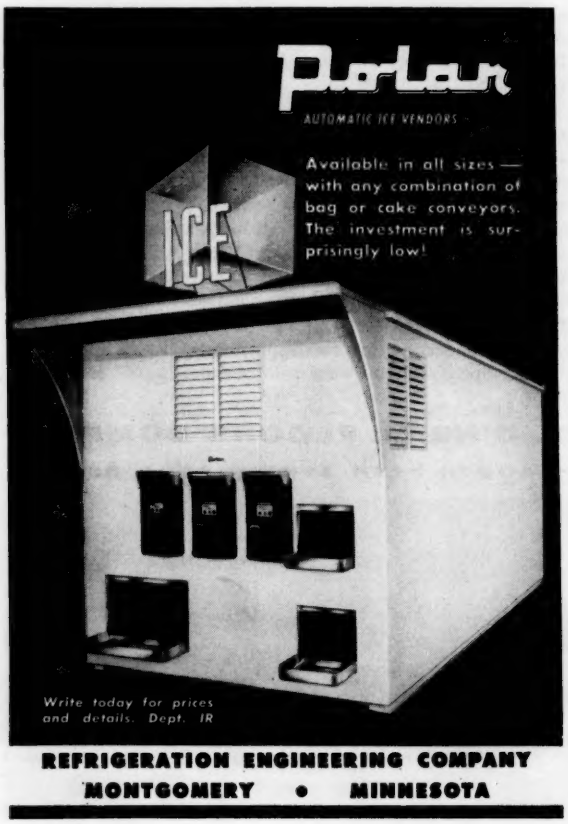
Fire Hits Seaford Ice Plant

THE OLD Seaford Ice and Cold Storage plant, Seaford, Del., was swept by fire which is believed to have started from sparks from welding apparatus. Robert Laughlin, owner, said a welding crew had been at work in the engine room on maintenance work. The building was used as a stand-by plant. It had been closed all winter.

The fire raged for about two hours before being brought under control by the 35 firemen and all of Seaford's trucks and equipment. Laughlin said damages would run in excess of $20,000 all of which was insured.

Railroad Advertises Ice

A FULL page four-color advertisement, featuring a large ice block, of the Southern Pacific Railroad appeared in the December 26 issue of Time Magazine and the May 7 issue of Newsweek. The illustration consisted of an assortment of colorful vegetables and a refrigerator car in a 300-pound block of ice, pointing up the prominent place of ice in the protection of perishables from growing areas in consuming centers.


Polar
AUTOMATIC ICE VENDORS
Available in all sizes — with any combination of bag or cake conveyors. The investment is surprisingly low!
ICE
Write today for prices and details. Dept. IR
REFRIGERATION ENGINEERING COMPANY
MONTGOMERY • MINNESOTA

BOWER
BB BRAND
AMMONIA
Anhydrous Ammonia
OVER A CENTURY OF SERVICE IN CHEMICALS 1855 - 1956
PROMPT SHIPMENTS AND PURITY OF PRODUCT ARE TWO GOOD REASONS FOR SPECIFYING BOWER BRAND
HENRY BOWER CHEMICAL MANUFACTURING COMPANY
29TH AND GRAY'S FERRY ROAD
PHILADELPHIA 46, PA.

TRRF Annual Report

THE ANNUAL report of the Refrigeration Research Foundation has been issued by Director H. C. Diehl, covering the work of the Foundation to date, with special reference to progress in 1955. The research projects in which the Foundation had a part, financially and also in an advisory capacity, and in many cases in cooperation with industrial organization contributed to the following: frozen foods, refrigerating foods above freezing, long term investigations, short-term studies, general service, and counteracting misleading and potentially harmful speculation on sterilization of foods by irradiation.

Special attention is directed to the continuing collaboration with the National Association of Refrigerated Warehouses and a list of industrial and other groups. With the consolidation of the Foundation's financial structure which was completed in 1955, the outlook for the future can be said to be reassuring. Increasing attention is being given to undertakings that will advance basic knowledge and produce benefits of general public value. The establishment of the Samuel Cates Prescott Fellowship is the first step in the direction of encouraging young people to become interested in the problems of commodity refrigeration and providing concrete assistance to the advanced education of young scientists.

The report includes a list of publications during 1955, classified grants in aid prior to 1955, and complete roster of officers and board of governors, members of the scientific advisory council and the industry advisory council, and list of sustaining members in 1955.

Packing Plant Enlarged

CONSTRUCTION has been started on the Chehalis Packing Company's new $34,000 addition to the main plant in west Chehalis. The addition, designed to house peach and corn processing equipment, will occupy the entire lot between the present plant and the distributing firm located adjacent to the packing company on State street. Chehalis Packing Company has had to increase its facilities several times over the past several years to keep pace with the demands of local growers, according to Ray Melhart, plant manager.

American Ice Buys Common Stock

AMERICAN Ice Co. so far this year has acquired about 4,200 additional shares of its common stock, at an average price of about $12 a share, the annual meeting was told. Last year the company bought in the open market 20,000 shares of its common, reducing the outstanding amount at the year-end to 373,835 shares. On this stock the 1955 net profit, from ice, laundry, coal and fuel oil operations, was equal after preferred dividends to $1.15 a share. For the first two months this year earnings were slightly higher than in the comparable period last year. Seasonally the third quarter is the company's best earning period.

Ice Plant Adds Freezer

A TAX exemption of $213,837 has been granted to the Independent Ice & Storage Co., Shreveport, La., for construction of an addition to its present plant which will house a cold storage plant with freezing facilities. Construction will begin some time this summer.

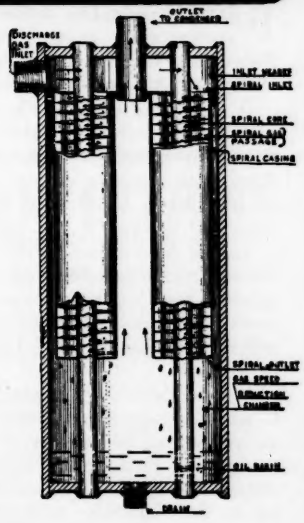
"KING ZEERO"
OIL SEPARATOR

Stops oil from entering condenser receiver and low side

Allows operation as originally intended. Simple in operation — no parts to wear out — no screens, metal wool or any close screens to clog, raise discharge pressures and cut down capacity.

When used in connection with air compressors, water is also separated with the oil.

Made in 12 sizes, ½" to 6".



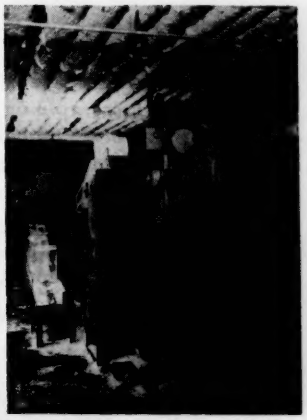
Built for years of trouble free service. Mechanical details on request.

THE KING ZEERO COMPANY
4300-14 W. Montrose Ave., Chicago 41, Ill.

New LABOR-SAVER

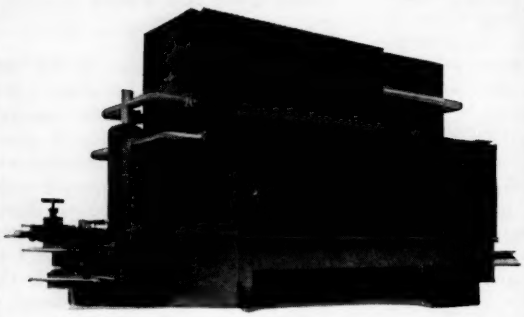
ESKIMO AUTOMATIC LOADER CRUSHER BAGGER

Lends itself to a variety of applications to fit your particular plant requirements.



This new 3-way combination includes: Eskimo Model 200 Weigher-Bagger; Eskimo Model 450-P Ice Crusher, and Eskimo Automatic Loader.

Write for full details
BALLARD SALES COMPANY
PO Box 1121, Fort Worth, Texas
Phone EDison 2-3216



NIAGARA SECTIONAL
***Aeropass* CONDENSER**
gives you lower cost refrigeration,
saves you ***LABOR,*** *Power, Water*

- **Because Niagara "Duopass" pre-cooling removes super-heat and gas condenses at lower temperature.**
- **Because the system is automatically purged of oil.**
- **Because the new design improves the heat transfer to the out-door air by evaporation.**
- **Because these features keep the condenser working for long life with "new plant" efficiency... always full capacity.**
- **Because you save 95% of cooling water cost.**

You save labor in upkeep. With full access to all parts and interior piping you see everything in easy inspections. You head off dirt accumulation and corrosion. Casing panels are removable without moving the coils. The coils can be cleaned from both sides.

First cost is low; freight is low because of the lowest space/weight ratio; you save much labor in erection. Capacity range is 90 to 240 tons. No other condensing method gives you so much saving in money and trouble.

Write for Niagara Bulletin 131.

NIAGARA BLOWER COMPANY
Dept. I.R., 405 Lexington Avenue
NEW YORK 17, N. Y.
District Engineers in Principal Cities

NIAGARA — *Over 40 Years' Service in Industrial Air Engineering*

Fish Processing Technologists to Meet at Rotterdam

AN international meeting of Fish Processing Technologists, organized by the Food and Agricultural Organization of the United Nations Interim Committee on Fish Handling and Processing, will be held in Rotterdam, Netherlands, from June 25 to 29, 1956, at the invitation of the Netherlands Government. Although invitations have been issued officially to the 72 member governments of FAO to send delegates, the meeting will be open to any fishery technologist who wishes to attend.

At FAO Headquarters, Rome, Dr. Ernest Hess, Chief, Technology Branch, Fisheries Division, FAO, and Secretary of the Interim Committee, said: "We want as many fishery technologists as possible to attend and take part in the discussions. Dr. G. A. Reay of the United Kingdom will be Chairman of the Meeting and the Chairmen of the four Committee working groups: Mr. F. Bramsnaes of Denmark, Mr. K. Bakken of Norway, Professor George Borgstrom of Sweden and Mr. E. Heen of Norway, will present their reports on chilling and freezing of fish, fisheries products for tropical consumption, and prepackaged fisheries products."

One day of the meeting will be devoted to visiting the new Fisheries Research Laboratories, fish pier and fish plants at Ymuiden. A symposium on the chilling of fish will be held during three days of the meeting. "The Symposium will deal with the use of antibiotics, bacteriostatic ices and dips, brine cooling, sea water ice, scale and crushed ice, and fresh fish quality assessment, using organoleptic and objective methods", explained Dr. Hess.

Fishery technologists who wish to attend the meeting should notify the Secretary of the Interim Committee, Dr. Hess, Chief, Technology Branch, Fisheries Division, FAO, Rome.

Frozen Vegetables Need Below Zero Storage

FROZEN vegetables suffer important losses in quality and vitamin content when stored above degrees Fahrenheit, research at the Pennsylvania State University College of Agriculture indicates.

It was found that the vitamin C (ascorbic acid) content of eight frozen vegetables dropped significantly after only four months' storage at 10 degrees Fahrenheit. After twelve months' storage at this temperature, the average vitamin C retention of the vegetables was only about 20 percent of the normal level.

Among food chemists, the amount of Vitamin C lost during storage is used as an indicator of change in food quality. Significant decreases of that vitamin in many foods are "associated invariably with or followed by" unfavorable changes like off-color, off-flavor and decrease in firmness.

At zero degrees Fahrenheit or less, however, vitamin C retention was much better, and at minus 20 degrees an average of 93 percent of the pre-storage vitamin C was present in the eight vegetables after twelve months' storage. From 45 to 89 percent of the vitamin was present in the vegetables stored twelve months at zero degrees.

While there may be some question as to the advantage of storing vegetables at minus 20 degrees over storage at zero degrees because of economic factors, it is obvious that storage of vegetables at 10 degrees will not be entirely satisfactory even when the period is for only four months.

New Water-Cooling Standards Now Available

A MUCH-NEEDED new standard for "Water-Cooling Towers for Use with Air-conditioning and Refrigeration Equipment" has been released by the Air-Conditioning and Refrigeration Institute. It is known as ARI Standard 910-55.

The purpose of the Standard is to establish minimum requirements for the design and construction of prefabricated natural-draft and factory-assembled, mechanical-draft, water-cooling towers for use with air-conditioning and refrigeration equipment.

This Standard covers prefabricated natural-draft water-cooling towers and mechanical-draft water-cooling towers which are factory assembled into sections by the manufacturer.

The new standard defines the following types of water-cooling towers: Natural-draft, mechanical-draft, induced-draft, forced-draft, spray-draft, spray-filled, deck-filled, and packed. It also explains circulating water, cooling range, approach, drift, blow-down, make-up and total heat dissipation.

Copies of the new Standard are free upon request. Simply write to the Air-Conditioning and Refrigeration Institute, 1346 Connecticut Avenue, N. W., Washington, D. C.

Study Heat Loss Through Building Entrances

THE AMOUNT of winter heating or summer cooling by traffic through building entrances is the subject of a new research project by the American Society of Heating and Air-Conditioning Engineers it is announced by Prof. Burgess H. Jennings, Evanston, Ill., chairman of the Committee on Research of the Society. It is expected, according to Elmer R. Kaiser, ASHAE director of research, that the results of this program will be of particular importance to manufacturers of doors, building owners and managers, and heating, ventilating and air-conditioning engineers.

Mr. Kaiser explained that the program, which will require a minimum of two years, is to be conducted in two phases involving laboratory work and field tests in a number of cities.

COMING CONVENTIONS

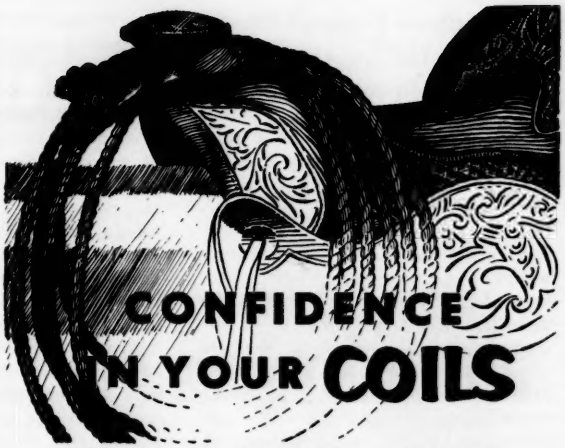
AMERICAN SOCIETY OF REFRIGERATING ENGINEERS
June 4-6, 1956
Sheraton-Gibson Hotel, Cincinnati
R. C. Cross, Exec-sec.

CANADIAN WAREHOUSEMENS ASSOCIATION
July 2-5, 1956
Digby Pines, Nova Scotia
H. Cecil Rhodes, Managing Director

NATIONAL ASS'N PRACTICAL REFRIGERATING ENGINEERS
Oct. 29-Nov.2, 1956
Statler Hotel, Detroit, Mich.
J. R. Kelahan, Secretary

NATIONAL POWER SHOW
November 26-30, 1956
New York Coliseum, New York

INTERNATIONAL HEATING AND AIR CONDITIONING EXPOSITION
February 25 - March 1, 1957
International Amphitheatre, Chicago, Ill.



When it's a question of new refrigeration coils, it's no time to speculate on dependability or to compromise on quality. And where it's a question of assuring efficient, uninterrupted operation and low maintenance throughout the years —

NATIONAL
REFRIGERATION COILS

offer you the benefits of over 70 years' specialization in the pipe-bending field: experienced engineering and exact production, with smooth bends, perfect welds, and accurate measurements.

Whenever you need coils, write for our free tracing-chart which shows standard dimensions ready to fill in. It will simplify your specifications—whether for zig-zag or nested box or conical or round-flat or reducing coils.

NATIONAL PIPE BENDING COMPANY
162 RIVER STREET • NEW HAVEN, CONN.

Established 1883

Research on Frozen Milk

(Continued from page 3)

the casein coagulation reaction. It thus appears probable that casein is stable in approximately 0.6M solution, pH 5.8, but quickly precipitates at the lower pH and higher salt concentration developed as lactose crystallizes.

Freezing to a lower temperature would freeze out more water, but lower temperatures also increase the viscosity and stability of the supersaturated lactose solution. The net effect is that frozen milk has a much greater storage stability at lower temperatures. To duplicate this stability at higher temperatures it therefore appears necessary to find a bland, non-toxic stabilizer that will delay lactose crystallization and give the unfrozen portion a very high viscosity. If the search for such a stabilizer is successful it should be possible to store milk economically for long periods and to market it through the normal frozen food channels.

Improving Refrigeration Systems

(Continued from page 37)

an entire engine room of 100 tons capacity at an average annual condensing pressure of 165 psig just to feed a few ticklish valve orifices when a low annual average of 111.5 psig is available. As previously noted, such a plant would draw about 131 Bhp against a possible 96 Bhp, a loss of 35 Bhp. By operating at the 96 Bhp point and then increasing the liquid line pressure to the desired 165 psig only a small pump or compressor driven from a 1 to 2 hp motor is required.

To accomplish this, a small unit with a receiver tank and pump similar to the widely used rural home water pumping unit would be sufficient. However, to avoid the use of the liquid pump, the preferred design would be a system similar to the Recirculator, using a compressor to accomplish the pumping by means of gas displacement.

The amount of gas necessary to do the pressurizing in a 100-ton ammonia plant at 25 psig suction pressure and 80 psig condensing, with 150 psig imposed on the liquid line, is only 1 cfm plus reexpansion and other losses. Assuming a very safe figure of 2 cfm for purposes of discussion, the compressor will require only 1½ hp motor. It appears that power savings in the average plant during one season should be sufficient to retire the investment on such a unit. No drastic plant changes are required for its installation. In case of failure of the unit, the plant automatically returns to the conventional arrangement.

News of People

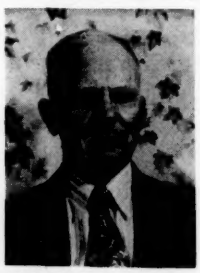
Sinek Re-elected Chairman City Products Corp.

WILLIAM J. SINEK was re-elected Chairman and Chief executive officer of City Products Corporation at the annual stockholders' meeting held recently in Cleveland, Ohio. Elected to new posts were Andrew R. Carlson, as president; William F. Zeidler, as executive vice-president and treasurer;; Daniel J. Mulvihill, as vice-president and secretary. Carlson had been a vice-president of the corporation, Zeidler previously held the post of vice-president and treasurer and Mulvihill was secretary. George S. Carter, a divisional vice-president of the corporation and president of Pilsener Brewing Company, Cleveland, Ohio, a subsidiary of the corporation, was added to the board of directors, and elected a vice-president of the parent company.

In his report to the stockholders, Mr. Sinek pointed out that the corporation's 1955 earnings were the highest in five years, amounting to $3.30 per common share, as compared with $2.82 per common share in 1954. The Corporation's net sales for 1955 amounted to $81,262,553, as compared with $80,764,161 for 1954. The Corporation's diversified activities, he stated, continued to show an upward trend in the first quarter of 1956, and it is believed that the earnings will continue to show a material increase for the current year.

DEATHS

JOHN WESLEY LAMPHIER, chief engineer for The Terminal Refrigerating Company, Los Angeles, Calif., before he retired in 1944, died April 24. He started with Terminal Refrigerating in 1918 and in a few years



John W. Lamphier

became chief engineer. Mr. Lamphier had been a member of NAPRE since 1922, when he joined the Chicago Chapter. He was an honorary member of The Los Angeles Chapter.

FRANK M. PUMPHREY, Daytona Beach, Fla., refrigeration engineer with Bostwick Inc., died April 3. He was division manager of City Products Corp. from 1940 to 1948.

NEW **KRACK LOW TEMPERATURE Electric Defrost Unit Kooler** *Completely Automatic*

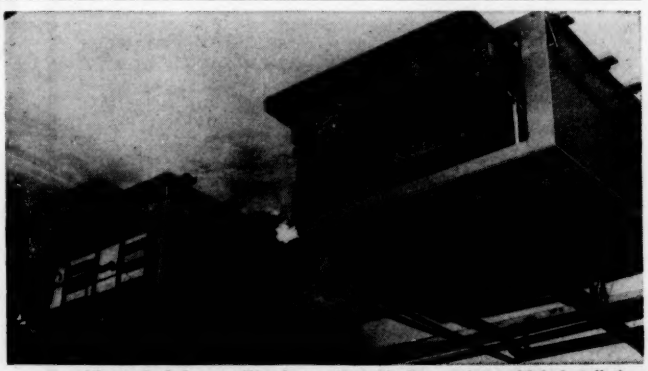
- Fewer defrost periods needed.
- Insulated cabinet retains, circulates heat when closed . . . speeds defrosting.
- Internally wired for easy installation.

GET NEW BULLETIN ED-1055 for details and specifications!

KRACK REFRIGERATION APPLIANCES INC

911 W. Lake St., Chicago 7, Ill.

25th Anniversary in Refrigeration & Air Conditioning



Liberty Cash Grocery Warehouse, Memphis, Tenn. using multiple installation.

MANUFACTURERS' NEWS

Du Pont Announces New Packaging Site for Freon

CYLINDER loading and shipping facilities at the Du Pont Company's new multi-million dollar plant for manufacture of "Freon" refrigerants and aerosol propellents at Antioch, Calif., will be in operation by June 1. After that date, the company announced, shipments of "Freon-12" refrigerant for customers in the area west of the Rockies will be made from the Antioch location. Bulk supplies of the chemical will be shipped to the Antioch plant site in tank cars from an existing manufacturing unit at East Chicago, Ind., for repackaging in ton cylinders and smaller containers.

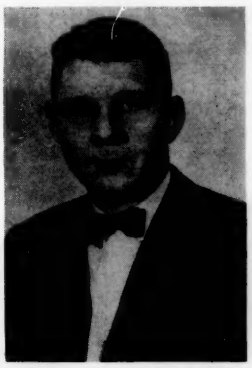
Manufacturing facilities being built on a 500-acre tract along the San Joaquin River two miles east of Antioch will be completed and in operation about September 1, with "Freon-11" trichloromonofluoromethane and "Freon-12" dichlorodifluoromethane as the initial products.

Completion of warehousing and reloading facilities is being rushed, the company's "Kinetic" Chemicals Division explained, to speed up delivery service on "Freon-12" refrigerant in advance of the plant opening. Customers in the Western district already have been asked to return empty refrigerant and propellent cylinders direct to the Antioch location instead of the former East Chicago, Ind., shipping point and the change is expected to result in faster refund payments.

After September 1, the company said, it is anticipated that all Western district requirements for "Freon-11" and "Freon-12" compounds will be supplied from Antioch production. "Freon-22" refrigerant, produced at the Du Pont Company's Louisville, Ky., plant, also will be repackaged and warehoused at the Antioch site after September 1 to provide fast service for West Coast users.

Acme Names Hassenplug Director Of Engineering

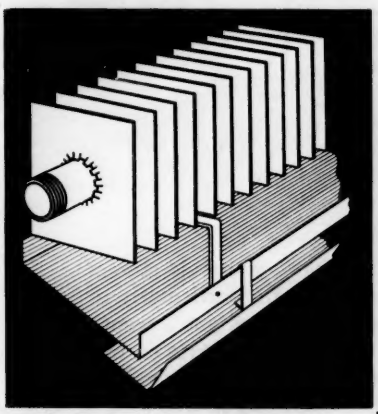
ACME INDUSTRIES Inc., Jackson Mich. announces the appointment of Walter M. Hassenplug director of engineering. A graduate of Rensselaer Polytechnic Institute and a registered professional engineer (New York), Mr. Hassenplug comes to Acme with a wide and diversified background in all phases of compressor, chiller, and condenser design and production.



Walter H. Hassenplug

He began his professional career in 1937 as a student engineer with the Ingersoll-Rand Co. at Painted Post, N. Y. In 1946, he was named engineer in charge of the experimental reseach department working on diesel and gas engines, inter-coolers, and compressors. He then spent three years with the Carrier Corp., Syracuse, N. Y., as a project engineer on heavy equipment — condensers, chillers, and reciprocating compressors. Just prior to joining Acme,

This new finned pipe is available in lengths of 5', 6'8", 10' and 20' — and with fin spacings of 1" and 1½" — to fit every application.



FRICK

Square-finned Pipe

Is ideal for cold storages, freezers, food processing and meat packing plants, etc. Manufactured from 2" dia. F.W. steel pipe and 7" square 14- gauge fins, Frick finned pipe gives maximum heat transfer per dollar invested. Each fin is bonded to the pipe under tons of hydraulic pressure. All assemblies are hot-dip galvanized.

These new Frick finned coils require only one-quarter of the space needed for bare pipe having the same surface. See your nearest Frick Branch or Distributor for complete details, or write for Bulletin 158.

DEPENDABLE REFRIGERATION SINCE 1882

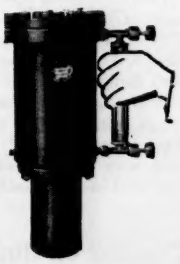
FRICK CO.

WAYNESBORO, PENNA. U.S.A.

Makes Refrigeration Systems Work Better

An Armstrong Purger Saves Power, Water, Labor . . . and Increases Capacity

Chances are, when your refrigerating system is being purged, you can smell refrigerant gas. That smell indicates:



1. You are losing valuable refrigerant gas.
2. You are not getting efficient purging of all the air in the system.
3. You are wasting power.

With an Armstrong Purger, one ice cream manufacturer reported head pressures reduced 40 lbs. and power costs cut 20%. Another saved $255 in ammonia the first year. Still another saves $500 in ammonia annually.

It's really worth looking into. *Send for Bulletin No. 2211.*

ARMSTRONG MACHINE WORKS

860 Maple Street, Three Rivers, Michigan

he was associated with the Air Conditioning Div. of General Electric Co. at Fort Wayne, Ind.

Mojonnier Appoints New Sales Engineer

THE following sales appointments have been announced by Mojonnier Bros. Co., Chicago, leading manufacturers of refrigeration equipment: URBAN EBEL is named to the Philadelphia sales staff. His wide engineering background will be of

Urban Ebel

Prescott S. Farrar

excellent help to Mojonnier's growing list of customers in this eastern area. BRUCE HULLINGER joins the Mojonnier Columbus, Ohio sales office, bringing to his new post a long and successful experience with plant processing operations. PRESCOTT S. FARRAR, well known member of the Philadelphia office moves to the Mojonnier New York sales territory, headquarters for which are in New York City.

Mercoid Appointments

THE following executive appointments have been announced by J. W. Owens, executive vice-president of the Mercoid Corporation, Chicago, Ill.

Willis E. Jones to the position of sales manager. In this capacity Mr. Jones will give executive supervision to the general selling activities throughout that corporation.

Paul J. Provost to the position of manager of the industrial controls division. This is a newly defined activity, closely identified with the work Mr. Provost has been doing for some years past.

In this general connection, G. R. Folds, Jr., is being recalled to Chicago from the West Coast area and will be assigned to work with Mr. Provost in the new industrial controls division.

Circular on Rink Equipment

A NEW circular issued by E. R. Carpenter describes the Carpenter spray nozzle which again is being manufactured by the Associated Parts & Tool Inc. 12212 Sprecher Av., Cleveland 11, headed by "Peg" Ward, Superintendent of the Cleveland Arena for many years. Illustrated are squeegees, ice scrapers, ice chippers, snow catcher for Carpenter ice planer, resurfacing tank, ice scrapers in addition to the nozzle.

Glenn New Zone Supervisor For York Corporation

BREWER I. GLENN has been promoted from service supervisor to zone sales supervisor of York Corporation's Midwest District, headquarters in St. Louis, it was announced by C. C. Strauch, District Manager — Commercial. Mr. Glenn joined the York Corporation three years ago, having been a service supervisor for a St. Louis manufacturer of air conditioning and refrigeration equipment. He is a graduate of the York Institute of Refrigeration and Air Conditioning, located at the firm's plant in York, Pa. The Institute, with its own buildings, laboratories, and expert instructors offers comprehensive training program in all phases of the business, Mr. Cassatt pointed out.

Texaco Expands Technical Service in South

THE specialized service of The Texas Company has been expanded to Southern industry through a regional office of the Technical Service Division in Atlanta, Ga., opened January 1. This was announced by F. H. Holmes, vice-president in charge of the Division. The new service headquarters will be at 873 Spring St., N.W. The office will be under the direction of J. F. Collins, Jr.

IF YOU'RE EXPANDING your cold storage operations in the South, particularly in Louisiana and Mississippi, you'll want to consult with deep South experts on insulating materials and installation. REILLY-BENTON Company, Inc., operating in this area for nearly two decades, stands ready to help with your new cold storage facility. Contact us now, in the planning stages of your project, and one of our qualified, experienced representatives will work with you on the insulation phases of your projected operation.

Reilly Benton company, inc.
INSULATIONS
Insulation Engineers and Contractors
2502 POYDRAS ST., NEW ORLEANS, LA.

genetron®

Super-Dry Refrigerants

Jenni Genetron Says: **"No matter where you are there's a genetron wholesaler near you!"**

Coast-to-coast, America's leading Refrigeration and Air Conditioning Wholesalers feature *Genetron* Super-Dry Refrigerants. There's one as near to you as your telephone ready to supply you with complete stocks of *Genetron* Refrigerants and with up-to-the-minute data on their uses.

Remember—*Genetron* Refrigerants are super-dry! Their moisture content is exceptionally low; their overall purity extremely high. They meet the industry's most exacting refrigerant specifications . . . are freely interchangeable with comparable fluorinated hydrocarbon refrigerants produced by any other manufacturer. Follow the industry-wide trend to Super-Dry *Genetron* Refrigerants. Always ask for *Genetron!*

genetron 11 ORANGE LABEL
TRICHLOROMONOFLUOROMETHANE

genetron 12 WHITE LABEL
DICHLORODIFLUOROMETHANE

genetron 141 GREEN LABEL
MONOCHLORODIFLUOROMETHANE

genetron 226 PURPLE LABEL
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FREE! Valuable Folder!
Ask your wholesaler for special folder on *Genetron* Super-Dry Refrigerants. Contains pressure-temperature charts and other helpful information.

GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.
Offices in principal cities

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CATALOGS AND BULLETINS

Booklet on Staged And Closed Reversing Cycle

A NEW 12 page booklet with flow charts in colors has been issued by the A. I. McFarlan Company, Inc. of 90 West Street, New York covering their "Staged Cycle" and "Closed Reversing Cycle."

The staged cycle describes a means developed by the McFarlan Company, and covered by patent applications, whereby compressors can be staged in conjunction with the use of a wide range coil. The horsepower required for the first stages is very substantially reduced compared with ordinary air conditioning methods. The wide range coils permits the water to leave the coil at a much higher temperature than ordinary coils, usually approaching approximately 10 F to the entering air temperature. Since most systems have at least 25 percent outside air and are designed for about 95 F, the entering air temperature is approximately 84 F on a 95 F day. When water is cooled from 74 to say 66 F it is possible to increase compressor capacity over 80 degrees and reduce the horsepower per ton for this stage to approximately .6 Hp per ton. Progressively, the horsepower increases in each stage until the last stage approaches conventional requirements.

The reversing cycle is a new heat pump application involving two condensers, one for the cooling tower circuit and a second located in the chilled water circuit in such a way that a single pump provides heating or cooling through two streams of water to each coil. If heating is required, then hot water is provided to the coil. If cooling is required, then cold water is provided to the coil. The water is heated by the second condenser, and is in effect, the heat removed from the building which has to be cooled. This method is also covered by patent applications, and covers a number of new features.

The methods are applicable for large buildings, shopping centers, laboratories, etc. The staged cycle will always reduce compressor horsepower compared with ordinary methods. The closed cycle is particularly applicable to large buildings with interior areas which must be cooled, or shopping centers where there is a department store which must be cooled while other stores are to be heated.

Booklet on Maintenance

A BOOKLET describing their complete line of products and available services has recently been published by The Perolin Company, manufacturing chemists, New York. Booklet PP-4 will prove of interest to engineers and superintendents responsible for the operation and maintenance of boilers, oil burners, water supply systems, condensers, air conditioning and cooling systems, and similar apparatus. Both standard products and a number of new products are described. The new products represent the results of research by The Perolin Company to solve recent maintenance problems resulting from new equipment and new concepts in the efficient use of fuel. In addition, the booklet describes the more technical data that are available concerning each of the individual products covered, and tells how copies of these technical data sheets may be obtained. Booklet PP-4 can be obtained on request to The Perolin Company, 350 Fifth Avenue, New York 1, New York.

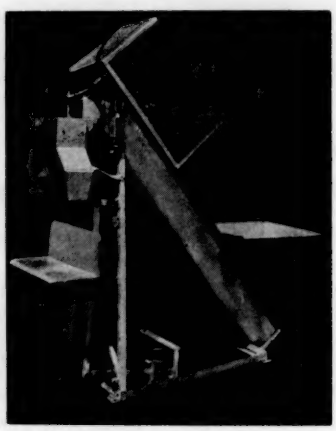
Valve Catalog

A NEW twenty-page catalog issued by Mercoid Corporation, Chicago, Ill., illustrates and lists specifications of magnetic and motorized valves for use with air, water, gas, steam, oil and refrigerants. It is illustrated throughout and includes a list price schedule.

SPEED PRODUCTION — CUT OPERATING COST

WITH THE NEW ICE-A-TERIA BAGGER-WEIGHER

Model 150-B



Designed for fast operation, the twin spouts let the operator remove one bag and replace with an empty. The second bag on the weighing platform has filled, the weight has stopped the machine. The minute the operator removes the filled bag, the scales move upward and starts the mechanism filling the second bag. The operator has only to move the flap in the dividing head the second he has installed the empty bag, this must be done before removal of full bag.

The bagger will fill 6 12½-lb. bags per minute, (360 12½-lb. bags per hour).

Powered with a 1/3 HP Motor driving a variable speed-drive for speed changes for approx. 100 RPM for smaller bags, to approx. 175 RPM for 25-lb. bags. Width 28", Height 77", Length 74", Shipping wt. 500-lbs.

100 Volt current, with manual starter is standard equipment. Snap switch is provided so operator has Bagger under control at all times.

PERFECTION
Ice Scoring Machine Co.
P. O. BOX 2140 FORT WORTH, TEXAS

ICE-A-TERIA also makes two other models of BAGGER-WEIGHERS: Model 300 and Model 1500.

OHIO SPECIAL ICE CANS

WELDED — RIVETED

ICE CAN GRIDS

Industrial Trucks and Trailers

THE OHIO GALVANIZING & MFG. CO.
NILES · Established 1902 · OHIO

Concrete Control Movie

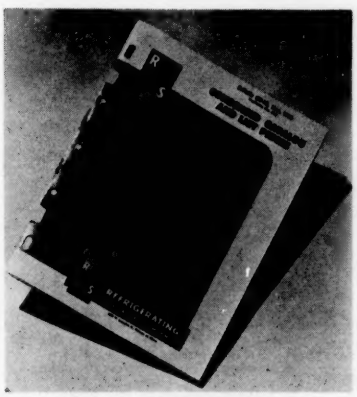
AN INFORMATIONAL colored motion picture which shows how Pozzolith, a control agent, will enable builders to produce a greatly improved quality concrete is available to organizations and firms who will correspond on letterhead. The Master Builders Co., a Division of American-Marietta Co., of Cleveland, Ohio and Toronto, Ontario, make this film available to the refrigeration industry. The film is in color and explains the factors of water, air and rate of hardening which must be controlled in producing concrete that will stand up under wear and tear in refrigerated structures. Pozzolith is said to control water content yet maintain workability, provide entrained air control to precisely meet job requirements, and also control the rate of hardening.

Caterpillar Diesel Booklet

IN A new booklet, "Why Cat Diesels Are Best," Caterpillar Tractor Co. explains some of the reasons these owners feel as they do. Seventeen of the most commonly asked questions about Cat Engines have been selected and answered. These cover economy, insurance rates, engine life, parts and service, ratings, turbochargers, availability for existing equipment, and others. Each answer is backed by hundreds of thousands of hours on actual field operation. Free copies of "Why Cat Diesels Are Best," Form No. 31873, are now available from local Caterpillar dealers or from Caterpillar Tractor Co., Peoria, Ill.

Control Valve Catalog

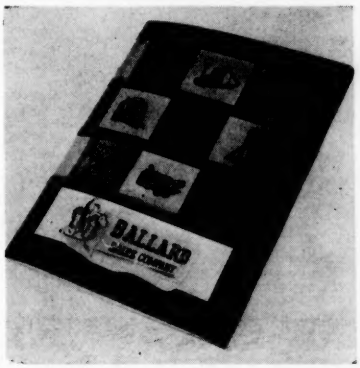
REFRIGERATING Specialties Company, Chicago manufacturer of refrigeration Control Valves, recently released an eight page condensed catalog which provides full capacity data and selection information for Freon and ammonia solenoid valves, back pressure regulators, evaporator controls, and condensing water regulators for medium and large air conditioning and industrial refrigeration applications.



Other new detailed instruction and application bulletins are available regarding refrigeration control valves for hot gas defrosting, low temperature, cooling tower water controls, and other special applications.

New Ballard Catalog

A NEW ice equipment catalogue has just been released by Ballard Sales Company of Fort Worth. Featured in this 88 page catalogue is a full line of completely automatic machinery designed to



cut labor and processing costs. Company president Joe Ballard says their Eskimo weigher-bagger and bag sewing machine have materially reduced production costs.

Catalog Describes Direct Expansion Cooling Units

A NEW catalog, DE-200, describes in detail Halstead & Mitchell's new line of direct expansion cooling coils, using its "Turbo-Flo" finned surface for extra high heat transfer. The catalog describes the construction of the coils including tubing, casings, headers, refrigerant distribution, return bends, and valves. Test and dehydration as well as means of specifying special coils are also described. Tables are devoted to dimensional data, pressure losses, and pressure drop, as well as methods of selecting direct expansion cooling coils.

Watkins Circulator

PUBLISHED monthly, "The Watkins Circulator" made its initial appearance in January. A 4-page color bulletin, this publication will serve as an outside house organ for the J. E. Watkins Company of Maywood, Illinois, manufacturers of liquid recirculators, hot gas defrost systems, condensers, purgers and heat exchange vessels.

Classified Advertising

All classified advertisements are payable in advance. RATES: 20c per word; minimum 25 words. $2.00 per line for bold face headings; $15.00 per inch for Except for Positions and Help Wanted classifications, this section is reserved exclusively for USED equipment. line listings.

Positions and Help Wanted

WANTED—Plant Engineer to operate cold storage and ice making plant. Must have experience in ammonia and ice manufacturing. Direct inquiries to Box 333, Rock Island, Illinois.

REFRIGERATION SALES ENGINEERS—Eastern manufacturer planning to open sales office in San Francisco requires qualified sales and application engineer and one junior assistant ambitious for training and promotion. Reply to Box MY-2, c/o Industrial Refrigeration.

USED EQUIPMENT—wanted & for sale

FOR SALE—Diesels 60 to 1140 h.p. V-belted or with generators; other electric equipment. J. B. Sims, 538 Woodlawn Ave., Grand Haven, Mich.

FOR SALE—4x4, 5x5, 8x8 Fricks. 5x5, 8x8 Yorks. 15 ton shell & tube condenser. 20" x 7' York receiver. Write E. Niebling, 1546 St. Clair Ave., Mt. Healthy, Cincinnati 31, Ohio.

FINNED PIPE FOR SALE—61 lengths 12' each. Made from 2" steel pipe-7" square fins 1½" apart; galvanized. New at only $3.00 per foot. Also 100 steel Hand Trucks. Medium duty; roller bearing wheels. New at $6.00 each. West Side Cold Storage Co., 7 Harrison St., New York 13, N.Y.

FOR SALE

1 — 12"x12" 4 cyl. late Frick compressor.
1 — 11"x13" 2 cyl. York direct conn. syn. motor.
3 — 10"x10" 2 cyl. York direct conn. syn. motor.
2 — 9"x9" — 2 cyl. York direct conn. syn. motor.
1 — 7"x7" — 2 cyl. Frick direct conn. syn. motor.
1 — 7½"x7½" 2 cyl. York V. flywheel comp.
1 — 6"x6" — 2 cyl. Frick flat flywheel comp.
1 — 5"x5" — 2 cyl. Frick V. flywheel compressor.
3 — 9¼"x14" 115 h.p. Wolverine Diesel engine.
1 — 8 ton Niagara Evap. condenser.
11x22x47" and 11x22x51" ice cans.
Ice Plants — 20 to 100 tons.

ENTERPRISE EQUIPMENT CORPORATION
77 Alexander St. Yonkers, N.Y.
Cable: ENEQCO Phone: Yonkers 8-8118

FOR SALE — Refrigeration equipment; ice equipment; new, used. Advise us your needs. Use "QUICKSEAL" — stops brine tank leaks; easy, efficient, economical. Born Company, 80 East Jackson Boulevard, Chicago 4, Illinois, WAbash 2-3299.

FOR SALE

9x9 York V-belt drive 75 h.p. motor.
7½x7½ York V-belt drive 50 h.p. motor.
5x5 and 4x4 Yorks.
2—1300 D4 air cooling units.
2—8 KW MG sets.
11 x 22 51" ice cans.
130 h.p. 600 r.p.m. Diesel engine.
7 x 6 Troy Engberg Type E vertical steam engine.
14 x 15 Skinner steam engine.

JOHN F. CARSON
"A" & Venango Sts. Philadelphia 34, Pa.
GArfield 6-221

FOR SALE: Two 12¼x14½, 2 cylinder York ammonia compressors; one direct connected to 150 h.p., 164 r.p.m., synchronous motor with G.E. push button controller, 440V; one direct connected to 175 h.p., 180 r.p.m., synchronous motor with G.E. push button controller 440V. Machines used to make 100 tons of ice daily. Look at these machines and make offer. New Orleans Cold Storage & Warehouse Co., Ltd. 305 Gaiennie St., New Orleans 13, La.

FOR SALE — ICE MACHINES

1—10x10 York, with 150 hp. syn. motor;
1—10x10 York, with 125 hp. motor; V-belt drive.
1—6½x6½ York; 1—6x6 York;
1—5x5 Frick, with 20 hp. motor;
2—4x4 Yorks, self-contained, with 10 hp. motors.
AARON EQUIPMENT CO., 1347 S. Ashland, Chicago 8.

ICE PLANTS — for sale

FOR SALE—in Virginia. 20 ton ice plant, fully equipped and running; in excellent shape, including 125 h.p. Diesel engine. Also trucks and routes. Also will sell separately, or together, two coal yards and all equipment. Owner has other interests and cannot look after business. Address Box JU-3, c/o Industrial Refrigeration.

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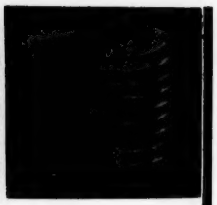

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40 hours without refrigeration during balmy spring weather

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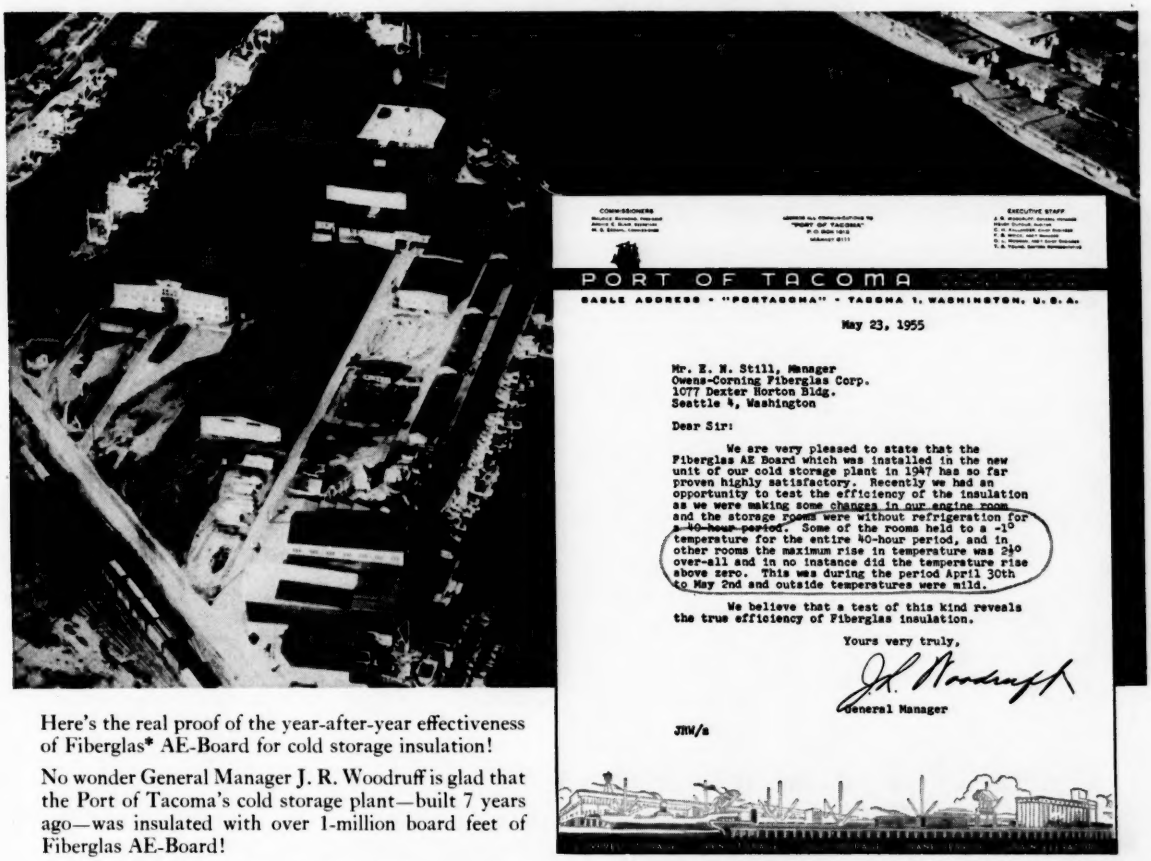

PORT OF TACOMA

EAGLE ADDRESS - "PORTACOMA" - TACOMA 1, WASHINGTON, U. S. A.

May 23, 1955

Mr. E. N. Still, Manager
Owens-Corning Fiberglas Corp.
1077 Dexter Horton Bldg.
Seattle 4, Washington

Dear Sir:

We are very pleased to state that the Fiberglas AE Board which was installed in the new unit of our cold storage plant in 1947 has so far proven highly satisfactory. Recently we had an opportunity to test the efficiency of the insulation as we were making some changes in our engine room and the storage rooms were without refrigeration for a 40-hour period. Some of the rooms held to a -1° temperature for the entire 40-hour period, and in other rooms the maximum rise in temperature was 2½° over-all and in no instance did the temperature rise above zero. This was during the period April 30th to May 2nd and outside temperatures were mild.

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J. R. Woodruff

General Manager

JRW/s

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...it not only offers insulating superiority, but because less thickness is required, Fiberglas makes extra storage space available!

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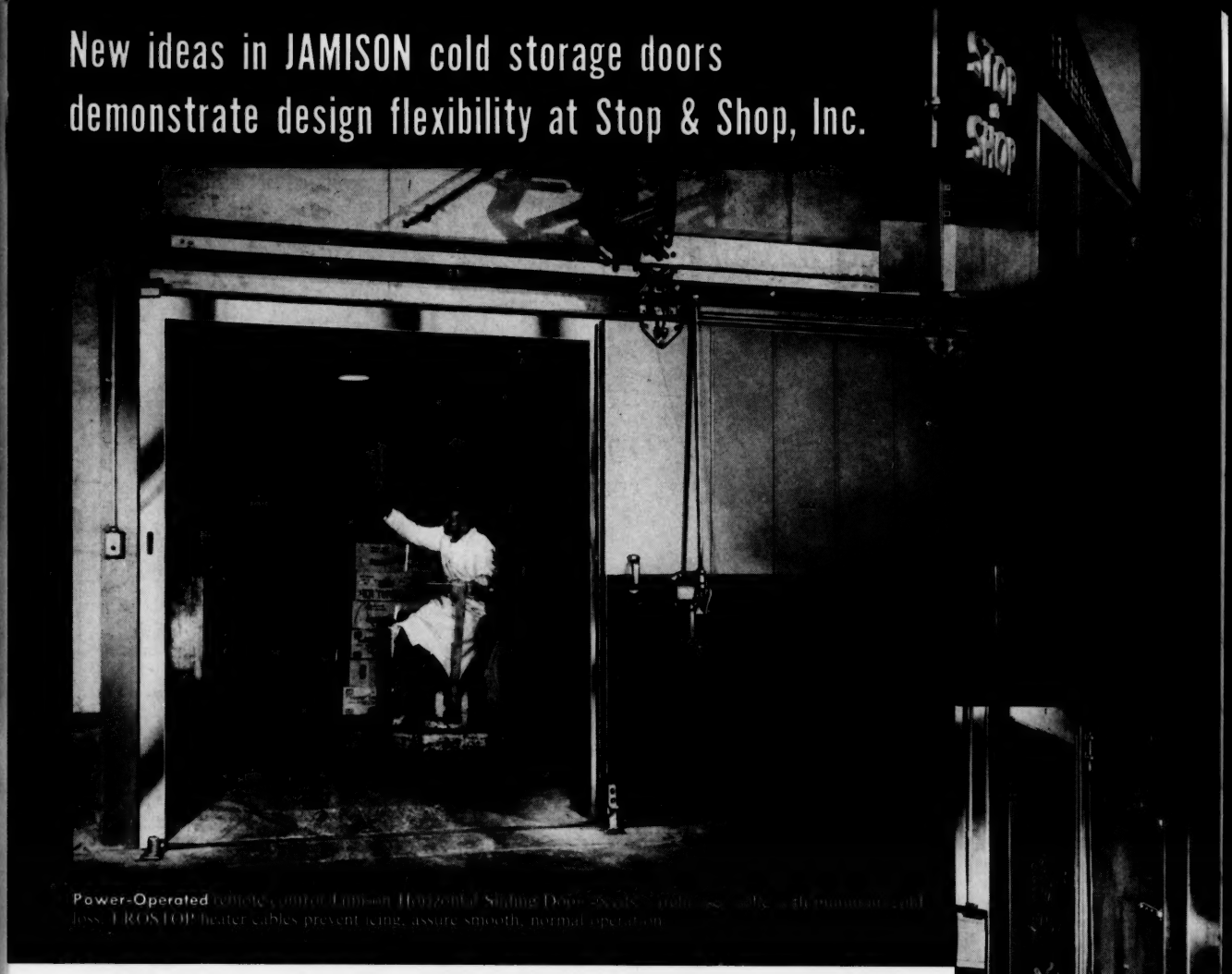

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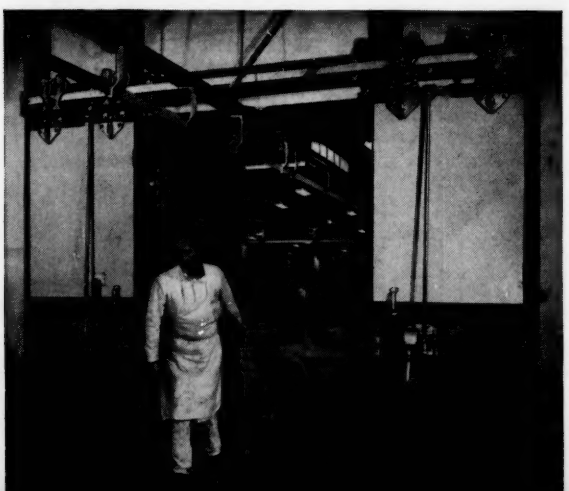

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